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The Physiography of the Vale of York

R. F. PEEL AND J. PALMER

ON THE SCALE OF THINGS BRITISH the Vale of York might well be styled a plain, for although a true vale in structure it is unusually large and, to the casual eye at least, unusually flat and featureless. It is also surprisingly little-known to the majority of geographers; not because it is off the beaten track, but rather because the tracks traversing it are so well beaten. Racing up the main line railway to Edinburgh, or down A.1 in a high-powered car, the traveller retains but a blurred impression of broad arable acres and of huge flat airfields, the whole set like a vast lake in a framework of distant hills. But within the bold and uniform lines of this setting there exists a surprising diversity in detail; not indeed apparent to the hurried glance, but very real, and of great practical importance. This internal diversity consists mainly in small differences of level, of soil character and of drainage; none of them very obvious, but all of them bound tightly into the texture of settlement and land use that gives the Vale its characteristic landscapes. From the physiographer's standpoint we have therefore two separate aspects of the Vale to consider: the first its overall shape, form and origin, the second its minor, yet highly significant, internal variations. The two take us into very different realms of space and time.

The origins and evolution of the Vale.

Taken as a whole, the Vale can be regarded simply as a northward extension of the plains of central England, for no strong relief feature breaks the continuity of the low ground between the Trent and Tees. The latitudinal limits of the Vale are thus conventional; the Aire-Humber water line, formerly marshy, in the south, and the ill-defined watershed, largely on glacial drifts, between the Ouse and Tees drainage-systems in the north.* To east and west, by contrast, the limits are real and obvious enough, for the Vale is enclosed in both these directions by bold hills. To the east the unbroken scarps of the Jurassic Cleveland Hills and Hambleton Hills rise remarkably steeply to moors reaching to almost 1,500 feet O.D., giving way further south to the lower and more rounded but still abrupt Cretaceous scarps of the Wolds, the gap between being plugged by the detached Jurassic

➤ Professor Peel is head of the Department of Geography in the University of Leeds; Mr. Palmer is a lecturer in the Department. Their paper is based on a lecture delivered by Professor Peel at the Spring Conference of the Association at York on 12th April 1955.

* The Vale of Mowbray around Thirsk is included here within the Vale of York. The boundaries we propose are similar to those used by Fawcett.¹

block of the Howardians. To the west the boundaries are somewhat less sharp, for a belt of undulating country marking the Permian outcrop is interposed between the flat lands of the Vale proper and the foothills of the Pennines, and the hill-flanks themselves, climbing up the dip-slopes of the Coal Measures and Millstone Grits, ascend at gentler angle; but on the small-scale map the boundaries here too are still reasonably sharp. Between these bounding hill-masses the Vale itself comprises a pear-shaped lowland, some 25 miles wide at its southern end; narrowing to half that at its northern apex 40 miles away, and with the greater part of its surface standing below the 100 foot contour. The first questions to be faced are why it exists at all, and how it came into existence.

The simple answers are familiar to everyone; the more detailed are irritatingly vague. Comparison between topographic and solid geological maps (see Fig. 1) shows at once that the Vale coincides almost exactly with the broad outcrop of the thick and unresistant Triassic sands and marls which dip steadily and gently eastward. The Vale is thus in essentials simply a geologically controlled strike valley, or trench, of erosional origin, the unusual thickness and gentle dip of the Trias accounting for its breadth. But it is less easy to say just how and when it was excavated, save that the work was completed prior to the last glacial age, for the existing surface is comprised almost throughout of a thick mantle of mixed glacial, fluvio-glacial and lacustrine drifts. To be more precise, however, we have to use some imagination and to look outside the Vale itself at its bounding framework of hills.

A distinctive feature of these surrounding hills, noticed and commented on even in the early days of geology, is the prevalence of flattish surfaces truncating their tilted and folded strata.* In the nineteenth century these surfaces were commonly presumed to have been cut by the sea as the uplift which created the hills brought their rocks within reach of wave-action; but the necessary conditions of a prolonged still-stand at about sea-level, followed later by renewed and rapid uplift to their present situation, were not recognized even by so advanced a worker as Fox-Strangways.³ With the rise of the American school of physiography at the end of the century the alternative possibility of a subaerial origin for these high-level erosion surfaces was envisaged, the inspiration coming from W. M. Davis himself. In his famous paper on "The development of certain English rivers"⁴ Davis suggested that central and eastern England owed its physical layout to a double cycle of subaerial erosion, the present features having developed around a drainage pattern inherited in essentials from a peneplain cut by an earlier subaerial cycle. This scheme he tentatively extended into Yorkshire, and the idea was accepted and amplified in

* An interesting short summary of ideas on the age and origin of the Pennine top surface or peneplain may be found in McConnell, pp. 154-5.²

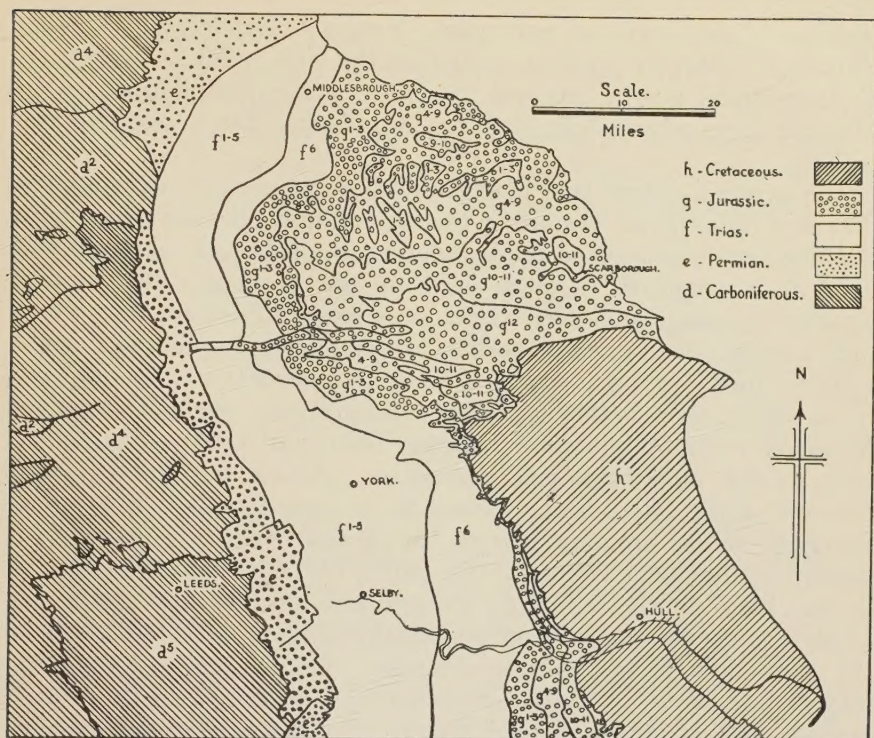


Fig. 1.—The solid geology of the Vale of York. (Based on H.M. Geological Survey Map 1:625,000, 1948.)

our area by Cowper Reed.⁵ An important addition was made by Reed, however, for he recognized that if the levelled-off upper surfaces of the Pennines, North York Moors and Wolds were to be associated as surviving portions of a formerly continuous peneplain, this former surface must have been not only uplifted but substantially warped in the process. Uplift and warping Reed assigned to Miocene times, so that the peneplain itself must have been cut in the earlier part of the Tertiary. If Reed's view is accepted, we thus have a significant difference in age of formation between this Yorkshire peneplain and the well-known peneplain in S.E. England recently described by Wooldridge and Linton.⁶ But subsequent workers in northern England have been very guarded in their use of period names in connection with Tertiary events and their deductions are thus sometimes difficult to relate to events in southern England.

Trotter, discussing the Alston Block in 1929,⁷ retained the same idea of a peneplain deformed by warping (and faulting), but was apparently prepared to assign these deformations to Pliocene or even post-Pliocene times. In this event the peneplain itself must have been cut in the interval between the mid-Tertiary (?Miocene) uplifts, and these later disturbances. For the Askrigg Block, Hudson in 1933⁸ talked of an "early Tertiary" uplift and "late Tertiary" warping and

faulting of the resultant peneplain. Versey's consideration of East Yorkshire⁹ followed Reed in assigning the first uplift to very early Tertiary times, but he retained the pre-Miocene peneplain into post-Miocene times with relatively minor disturbance due to warping and faulting.

The general picture that emerges from these various suggestions is that after the original Armorican folding and uplift the whole northern Pennine area was reduced by denudation to a subdued condition and flooded, in whole or in large part, by the Mesozoic seas, so that Triassic, Jurassic, and even Cretaceous formations were laid down right over it. Then in early Tertiary times a general uplift, with slight easterly tilt in our area, initiated a sub-parallel series of east-flowing rivers which, over a very extended erosion cycle, gradually stripped the cover rocks off the central higher tract, and reduced the whole area to the aforementioned peneplain. During this long period, however, as visualized by Davis and Reed, considerable modifications developed in the drainage pattern; in particular the ascendancy of a powerful subsequent tributary (the proto-Yorkshire Ouse) which cut its way back up the retreating Triassic outcrop, captured in turn a whole series of the east-flowing consequents (Fig. 2), and so established the main lines of the existing drainage. Finally renewed uplift in mid-Tertiary times (? Miocene) raised the peneplain to its present position and at the same time greatly rejuvenated the rivers which proceeded to carve out the present Dales and Vale of York. The great width of the latter we must presumably attribute in part to rapid retreat of the Jurassic and Cretaceous scarps across the thick Triassic beds, and its depth to the soft and unresistant nature of the Triassic formations themselves in comparison with the tougher rocks above and below them—remembering that the present Ouse, a completely separate river from that which guided the main excavation, was re-established in post-glacial times on the glacial infill.

This interpretation, although in origin now 50 years old, has not to the writers' knowledge yet been seriously challenged (cf. Versey's account of "The Build of Yorkshire"¹⁰), but it involves a number of difficulties. In the first place there have been in recent years a number of doubts raised about the former presence of a Mesozoic or Cretaceous "cover" over the Pennines. Linton has repeatedly championed this thesis,¹¹ but Arkell has advanced geological arguments against it,¹² and some students of river-evolution in northern Britain have abandoned it; as for instance George in his study of the Clyde drainage,¹³ and Sissons in his interpretation of the denudation chronology of the south-eastern Pennines.¹⁴ Dunham also has recently questioned Trotter's evidence for a mid-Tertiary warping of the Alston Block peneplain.¹⁵ Space will permit no more than a mention of these criticisms; but there are also difficulties about the timing. It has already been pointed out that the peneplain came to be generally

regarded as a product of pre-Miocene erosion. The evidence for this conclusion, so at variance with conditions further south, is, apart from the lack of early Tertiary deposits, entirely morphological, and depends to a great extent on the interpretation placed on drainage patterns.* In the North Yorkshire Moors, however, the Cleveland Dyke outcrops on the moor around 950 feet o.d. in a position which makes it clear

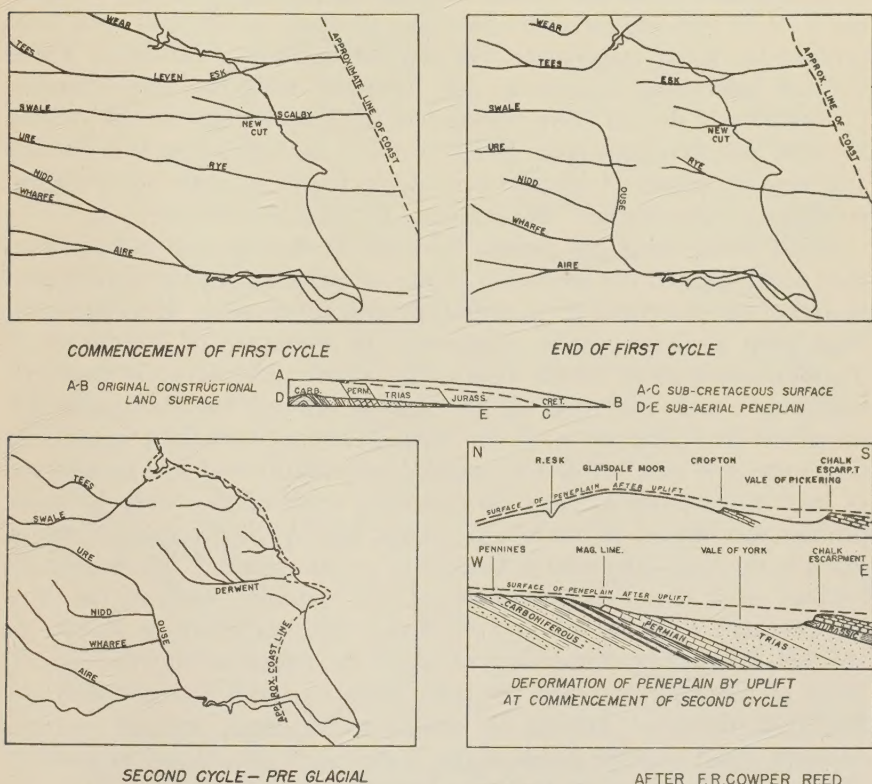


Fig. 2.—The erosional origin of the Vale of York. (Based, with slight additions, on F. R. Cowper Reed, 1901.)

that the surface developed locally around that height has cut across the dyke. As this surface is either part of the so-called warped peneplain, or part of an erosion surface cut into the general peneplain surface, it is clear that the age of this cutting is later than the date of the intrusion of the dyke. Fortunately, this particular dyke has been dated accurately by Holmes and Dubey,¹⁷ and it seems to be much younger than Eocene, and probably of Oligo-Miocene age.† It may therefore be permissible to suggest that the peneplain in N.E. Yorkshire

* "The evidence for the differentiation of two periods of uplift in Tertiary times is far from satisfying." Kendall and Wroot, p. 422.¹⁶

† The age of the dyke found by the helium method is 26 million years. According to recent estimates, the Miocene period began between 26 and 32 million years ago (Holmes¹⁸). Professor Holmes was good enough to confirm this interpretation in correspondence.

was cut in post-Miocene times and in this sense is comparable with the one in southern England, the age of which is attested by the prior folding of Oligocene deposits.* We therefore return to the situation urged by Davis, and in the present state of knowledge it would seem that all we can say with reasonable certainty is that the present river-systems seem to have evolved in general plan on a former widespread erosion surface re-elevated some time during the late Tertiary, and that the Vale of York, so far as we have any evidence at all, may well have evolved as Reed suggested. We are left guessing, however, about various interesting questions; for instance, why the Aire-Humber "consequent" should have succeeded in dominating all the others. Kendall and Wroot suggested that it did so because of greater volume and erosive power,¹⁹ Versey because it found a zone of structural weakness in the chalk.²⁰ But we have no certain evidence.

What recent work has shown, however, is that the fall in base-level that accompanied the elevation of the peneplain, and the consequent phases of downcutting, were not steady and continuous. Hollingworth, from map analyses, earlier suggested the existence of a number of fragmentary erosion levels below the main peneplain in northern England,²¹ and Sweeting, in her studies around Ingleborough, has identified and mapped a major erosion surface at about 1,300 feet (i.e. some 700 feet below the original peneplain) and has recognized at least two phases of later downcutting revealed not only by river profiles and related features in the Dales, but by the grouping of major caves in the limestone area of Craven at certain levels.²² More recently Sissons' work down the east flank of the Pennines south of the Aire has revealed a whole series of erosional benches down to as low as 200 feet, for the upper members of which he suggests a marine origin.²³ None of these surfaces has yet been associated conclusively with the Pliocene incursion known in southern England, though certain deposits piped into the chalk of the Wolds were considered as possibly Pliocene, or perhaps Old Drift, by Versey.²⁴

Such evidence as may exist for the later denudational history of the Vale must probably be sought along the Pennine flanks, for on the eastern side of the Vale scarp retreat has probably destroyed most of it, while such stages as may have existed on the Trias have been obliterated. According to Ainsworth an erosional stage related to a base-level at about 200 feet O.D. is, however, clearly displayed on the Jurassic sub-scarp in advance of the main Chalk scarp in the east,²⁵ and this is balanced by similar evidence on the western side of the Vale.²⁶

The lowest levels reached by erosion can only be ascertained from borings through the drift in the Vale; but sufficient data are now available to show that much of the Vale floor was cut to levels well

* The re-interpretation of the age of the peneplain makes a re-interpretation of the landforms of N.E. Yorkshire desirable; a study which one of the writers hopes to present shortly.

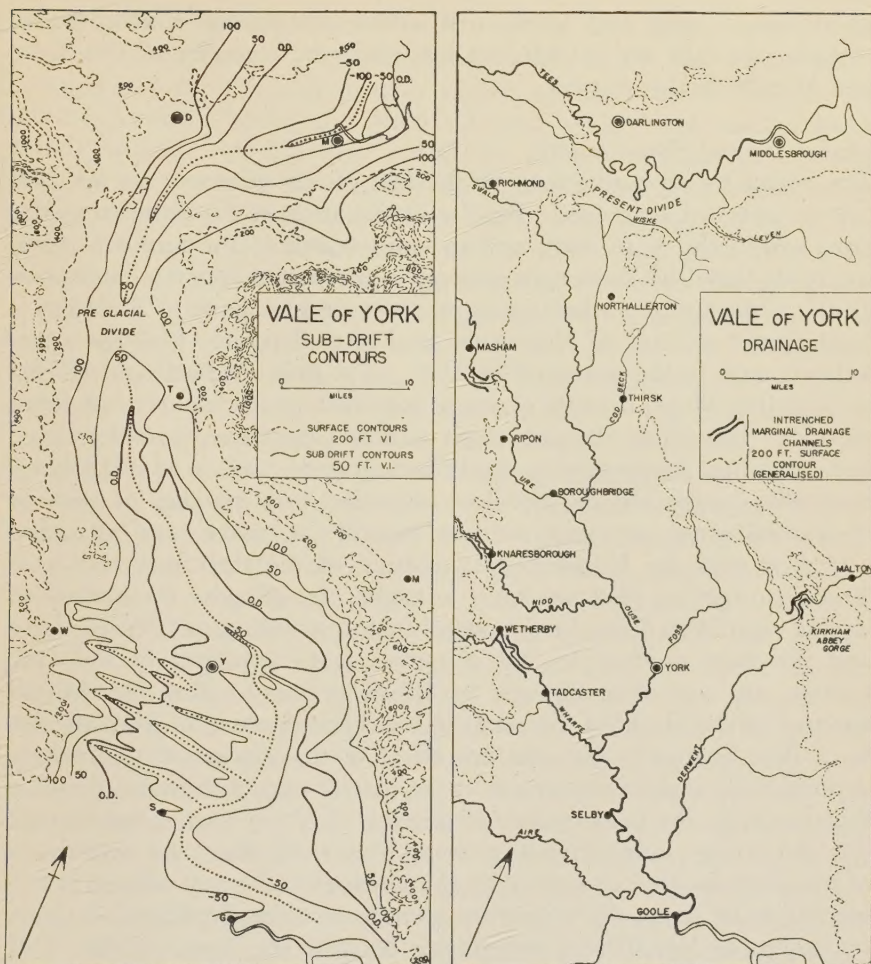


Fig. 3.—The sub-drift and surface drainage of the Vale of York. The left-hand map was compiled from various secondary sources, ultimately of course from the records of the Geological Survey. The central portion was initially plotted by Kirkham²⁷ from the Geological Survey Wartime Pamphlets on Water Supply. The northern portion was added from Radge²⁸ and Raistrick²⁹ and the southern portion from Wilson.³⁰ The map is not intended to be more than a suggestion. The depth of the deep channel through the Humber is something below -90 feet o.d.³¹ but occasionally bores in the central Vale reach below this, e.g., Barnby Dun (Nat. Grid ref. 44.6208) -170 feet.³²

below present sea-level. The map (Fig. 3) shows sub-drift contours plotted from the bore-hole data, and suggests the existence of a number of closely spaced valleys running west to east to join a narrow main valley trenching the central axis of the Vale and dropping to at least 90 feet below present sea-level near Hessle. At the northern end of the Vale borings reveal that at this low sea-level stage the Swale ran northwards into the Tees, its addition to the Ouse system being thus post-glacial. More detailed studies of the sub-drift surface and

its drainage lines and levels will afford interesting possibilities of comparison with the established buried lower channels of the Tyne and Wear³³ further north.

Glacial and post-glacial history.

The events so far outlined cover the first of our questions, so far as it can at present be resolved. But for explanation of the detailed variations within the Vale itself, and to some degree of the minor features round its edges, we must turn entirely to the events of glacial and post-glacial time, for as earlier mentioned the present floor of the Vale is built almost entirely of Pleistocene and later deposits. Only at a few isolated spots in the centre of the Vale, as at Brayton Barf, and Holme on Spalding Moor, does the Triassic floor emerge in distinctive isolated mounds. Elsewhere the landscape is based on varied boulder-clays, end-moraines, fluvio-glacial sands and gravels, and laminated clays generally interpreted as lake-floor deposits, with patches of peat in ill-drained areas, overlying alluvia around the rivers, and estuarine warps around the Humber flats. Much of the drift material is of Triassic origin so that we must consider the glaciers themselves as having contributed the final touches to the scooping out of the Vale; and this may account for the apparent fact—apparent because the borings are not close enough to afford certainty—that the buried channel of the Humber, like that of the Tyne, is shut off from the sea by a rock barrier.³⁴ But the net effect of the glaciation was purely depositional, and it is variation in the glacial and post-glacial deposits that produces the finer texture of physical diversity earlier mentioned. The details are, indeed, far from being fully worked out, for over much of the area detailed re-survey by the Geological Survey officers is still waiting to be done, while interpretation is exceedingly difficult largely, no doubt, as Wooldridge has stated, because the layout of the Vale caused successive glaciations (assuming that they occurred) to follow the same paths, so that “later advances in part destroyed the evidence of earlier periods, or buried it.”³⁵ The difficulties of interpretation are indeed so great that the great pioneer Lamplugh concluded that all might well be due to just one glaciation;³⁶ and this monoglacial approach has been revived in recent years by Carruthers³⁷ and adopted by a number of experienced northern geologists including W. Anderson.³⁸ The more orthodox view, however, is to assume that northern England, like the south of England and western Europe, experienced a number of distinct glacial advances and interglacial phases, although in our area the thesis is most difficult to apply. Within the Vale itself no clear distinctions of the drifts on grounds of age can be made with certainty, but around its flanks, as on the Pennine foothills and in the lower Dales, are patches of rather worn-down and featureless boulder-clay lying on the interfluves which contrast with the fresher hummocky drifts in the valleys and are now

generally interpreted as relics of an earlier drift-sheet whose main portions were removed by denudation prior to the last glaciation.³⁹ The somewhat perplexing gravels which cap the Triassic exposures in the south of the Vale have been referred by Melmore to the same earlier drift-sheet;⁴⁰ but they are almost all the evidence we have of it in the Vale proper. Within the Dales, and including the great mass of deposits in the Vale itself, we then have the main body of the newer drifts. These, from their erratic contents, would appear to have been laid down by confluent ice-streams coming down from the north and across the Pennines, and their southern limits are marked by the well-known arcuate terminal moraine running through Escrick. The linked parallel feature on which York itself is built, together with its main roads to east and west, probably marks a halt in the early stages of retreat. These moraines, which form flattish hummocky mounds standing 50 or so feet above the surrounding flats, appear to have been built by ice-melt in standing water, and their lower parts are buried under the later deposits. To the south of them extend great flats of mixed outwash sands and laminated clays which, together with the evidence of marginal deltaic deposits and abandoned spillway channels, have given rise to the generally accepted concept of a vast "Lake Humber" impounded between the northern and western ice-sheets, and the North Sea ice lying along the coastal tract. It is to be noted that this huge lake apparently existed concurrently with the glacial maximum, but no doubt it persisted, in dwindling form, for a long time as the ice-sheets slowly melted back. Certainly within the Vale we find north of the twin York moraines further extensive tracts of lake floor clays and outwash sands, these mixed deposits covering much of the central lower area and contrasting with the rather higher and more undulating belts of boulder-clay "shelf" along the flanks of the Vale. To the north, at Raskelf, and again in the Wells-Pickhill area, further arcuate morainic mounds may mark halts in the ice-retreat: the whole complex building a pattern of variation in detailed form, minor differences of level, and changes in soil texture and drainage whose broad outlines in this northern part were mapped by Wooldridge 10 years ago, and whose minor details are startlingly reflected in the patterns of settlement and land use. The map (Fig. 4) attempts only the boldest of schematic distinctions; and many complicating details, of interest to the physiographer, have been omitted from this brief outline. There is, for instance, the sequence of small gravel patches scattered around the flanks of the Vale south of the York-Esrick moraines at about the 100 feet contour and composed entirely of local material. These features, coupled with the presence of low bluffs behind some of the patches, and the circumstance that many dry valleys terminate at about the 100 feet level led Edwards to suggest that these deposits represent a former 100-foot strand-line, possibly marine, possibly lacustrine.⁴¹ The absence of these features north of the York

moraines suggests that the lake or sea that built them existed before the last glacial advance, and perhaps in the preceding interglacial. Again, recent remapping of the Leeds sheet by the Geological Survey⁴² suggests that the "New Drifts" may themselves be subdivisible into two phases, and in the Wetherby area a line of gravel hillocks running southeast towards Stutton is now interpreted as a series of kame-terraces built round the edge of the last ice-sheet during an advance phase to the southwest beyond the line of the Escrick moraine. No doubt as the re-survey extends many puzzles about the drifts will be resolved; but space will not permit further discussion of those problems here.

A word must be added, however, about the effects of the glacial events upon the drainage. Scattered marshy areas, such as Askham Bog just west of York, occupy ill-drained hollows in the drifts, while beyond the Vale itself the flats of the Vale of Pickering are the legacy of a separate major lake ponded back by the coastal ice, and drained westward into Lake Humber through the Kirkham gap. The anomalous course of the post-glacial Derwent derives entirely from these events; and as we have seen, the diversion of the Swale into the Ouse drainage would appear to have been another major legacy of the glaciation.⁴³ Down the western flanks of the Vale, also, we find several instances of minor drainage diversions, the most obvious being that of the Wharfe east of Wetherby which was pushed south to follow a path skirting the outer edge of the Escrick moraine.* Diversions, combined perhaps with the final lowering of base-level caused by draining of the great lakes, produced marked intrenchment in the lower valleys of several of the Pennine rivers where they run out into the Vale. The effect is most marked in the valleys of the Ure, Nidd, and Wharfe. In detail, too, other parts of the present drainage around the edges of the Vale are adjusted to channels carved by ponded meltwaters draining round the retreating ice-sheets, but many such temporary spillways are now abandoned and dry. The great series traced by P. F. Kendall on the North York Moors is too well-known to need comment;⁴⁶ but further series have been traced across the southern Wolds by de Boer⁴⁷ and along the western flanks of the Cleveland by Harrison⁴⁸ and Wilkinson.⁴⁹ Much, however, still remains to be done before we have a complete picture.

The final touches to the physiography of the Vale were added in post-glacial and historic times. Much less is known of these periods in our area than in, for instance, the Fens; but the Humber is known to have flowed at a much lower level through the drift plugging its former valley in Boreal times, when the sea-margin stood north of the Dogger Bank. The general rise of sea-level after Boreal times no doubt

* The marginal channels to the west of the Vale are described by Kendall and Wroot⁴⁴ and by Melmore.⁴⁵ No attempt has been made to show these or the channels on the east side of the Vale on our Fig. 4.

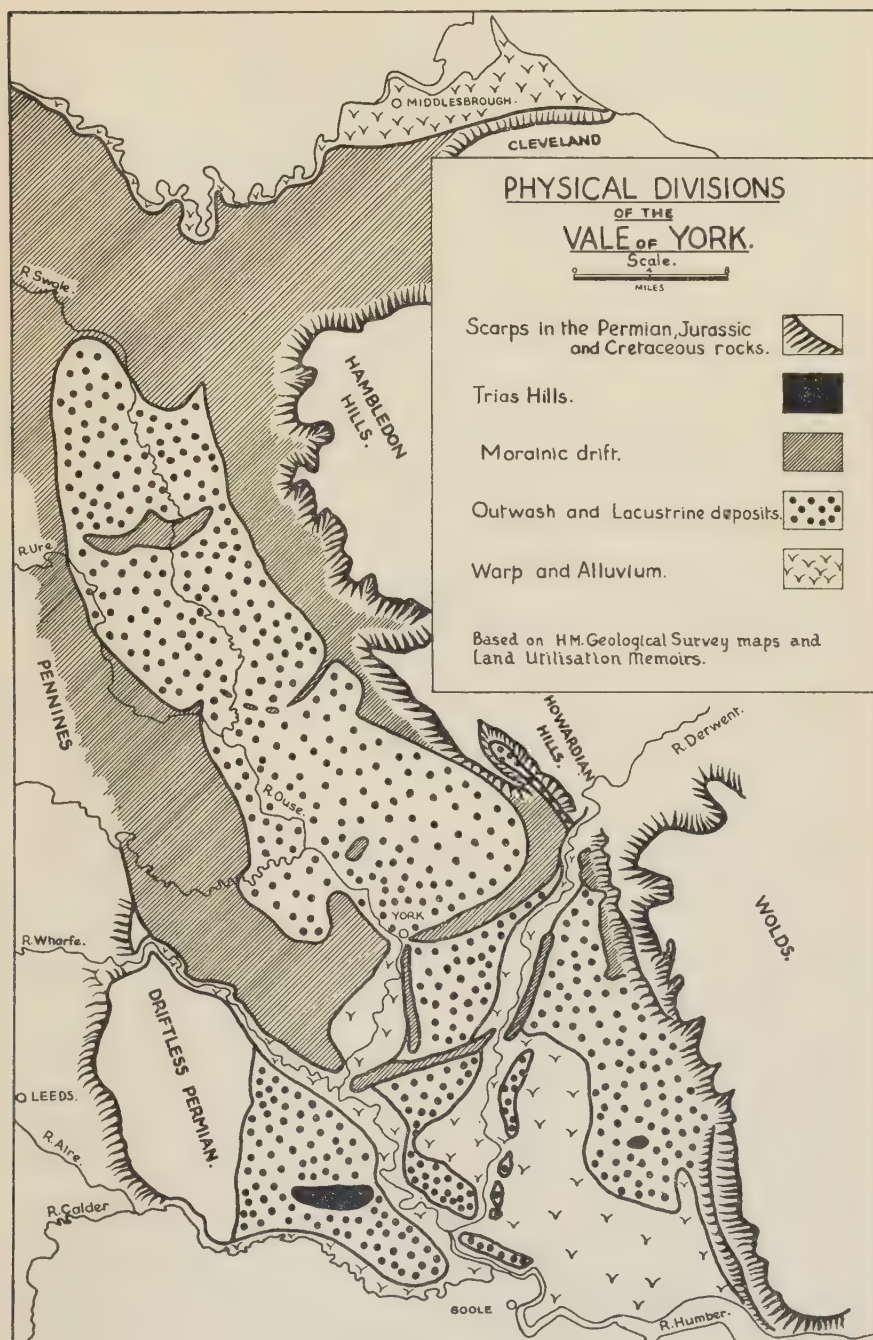


Fig. 4.

created the present wide Humber estuary, and by flooding the lower Ouse valleys initiated the long history of natural silting⁵⁰ which was later extended by artificial "warping" to expand the zone of estuarine reclaimed land.⁵¹ Late glacial outwash and post-glacial changes of base-level are reflected in flights of river-terraces in the valleys fringing the Vale, but only those studied by Melmore in the Derwent,⁵² by the Geological Survey officers in the lower coalfield valleys, and by Raistrick in connection with the Dales glaciers⁵³ appear to have been examined in detail. Much remains to be done before any regional synthesis can be attempted; but these post-glacial changes of level must clearly have been of great importance in so low-lying and watery an area as the Vale of York, and the recently demonstrated slow subsidence of the whole east coast must not be forgotten. Even at Crown Point Bridge in the middle of Leeds the land is only 80 feet above sea-level, and on the coalfield mining subsidence has added an artificial complication to naturally difficult problems of drainage. Indeed, although the surrounding hills are so much more immediately attractive, and so much better known, there is no lack of important and intriguing problems for the physiographer within the Vale of York, despite its apparent monotony. It has been said that plains tend to get neglected by physiographers. Fieldworkers in Yorkshire could do worse than take these words to heart.*

* It is hoped that a detailed analysis of the relief differences between various parts of the Vale may shortly be begun in the Department of Geography, University of Leeds.

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The Vale of York

The Evolution of a Landscape

MAURICE KIRK

THE VALE OF YORK, capable of simple definition in outline, but not perhaps of facile description in its local detail of physical character, presents two aspects to the human geographer and is possessed of one general quality. It is above all a clear regional entity comprising the basin of the Ouse, and focused now, as for a thousand years past, upon its ancient regional capital. A slight measure of the degree of York's permanent significance in this context is in the symmetrical net of eight important roads radiating out to the ring of attendant minor market centres situated at an average distance of a dozen miles from the city. These ancient routes link to the city some 350 square miles of long-settled agricultural land, a landscape of hedge and ditch and broad flat fields. Secondly the Vale forms a major link in the old north-south routeway, passing through the county. To the west of, and just above, the flat floor of the Vale, a "braided stream" of main roads and linking roads follows the Roman road (now A1) along the Magnesian Limestone ridge, and over its drift cover northwards through the Vale of Mowbray to the Tees and the northern terminus of Lowland Britain.

The general quality of this regional scene is its age as a humanized landscape; the southern part of the Vale where the flood plains of Ouse, Aire and Don meet in what were the Humberhead Fens, is almost literally artificial—a man-made land. The Vale was originally a cheerless terrain of forest and marsh, fen and sandy heath. Eighteen centuries of clearing, dyking and draining have civilized the land, resulting in the glossy meadows and fat brown plough-land of today. If one defines the Vale initially by the 100 foot contour, one ought to include not simply the flat levels of old lakebeds and outwash silts, but also smooth swellings of clay banks and gravel ridges; to the west the fields roll gently without a noticeable break of slope on to the red-brown soils of the Magnesian Limestone belt. This latter has given much to the personality of the Vale, although strictly speaking it remains outside it. Its yellow stone has weathered into creamy grey in the village churches of the Vale and in the walls of its capital; it is surrounded everywhere by pinkish red brick, evidence of both the basic and the superficial physical geography of our area, moulded historically into unnatural, utilitarian forms, as the whole surface of the land has been moulded.

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The human geography of the Vale of York is its historical geography; Professor Peel has described two different physical geographies of the Vale;* that of the superficial facts of glacial and outwash deposits, and also, much older of course, the topography of a pre-glacial drainage system which this later material has buried. An analogy might be suggested in the concept of two or three past human geographies of the Vale, not "buried" under the present in a literal sense, but obscured in the sense of being written over by stronger, more complex symbols on the palimpsest which is the modern map. This analogy must not be pressed, although if one thought of prehistoric and Roman Yorkshire as one early phase, and then Anglo-Danish and Norman occupation as another, contributing to the "basic" pattern of settlement and land use, then perhaps the period from the Dissolution to the Parliamentary enclosure movement and from this latter on to the present might be viewed as two final stages in the establishment of modern field and communication systems, just as successive glacial advances covered over a disappearing landscape with the surface which has survived for our examination today.

Several phases of change contributed to the growth of the present geography: one might draw attention to three, the primary colonization, stages of recolonization and further advance in land use, and thirdly the enclosure movement of the eighteenth and nineteenth centuries. Such stages do not fall into tidy historical divisions, applicable to the whole of the Vale. The draining of the Humber fens, Thorne and Hatfield moors and Walling Fen, really amounts to a primary colonization in one sense, but even as a recolonization, or as a change from extensive to intensive land use, it occurs centuries later than corresponding developments further north. By and large, however, it is safe to say that the modern field system and communication patterns are less than 250 years old.

We need not regard prehistoric settlement and Roman occupation as leaving permanent and widely distributed evidence on the Vale proper, and it may be said that the primary colonization fell within a period of about four centuries, during which Angle, Dane and Norman in turn descended from the Wolds, sailed up the Humber-Ouse, or filtered over the Pennines from Norse colonies further west. Danish culture and technique prevailed in establishing the locale of settlement and perhaps also distinct forms of settlement and field systems, in a colonization embracing a considerable proportion of the Yorkshire lowlands. In 915, about 40 years after Healfdene "portioned out the land of the Northumbrians," York was revived as a regional capital, a status it never again lost. Its earlier history, from the abandonment of *Eboracum* to this date, is not clear.

What kind of pioneer fringe was this central lowland? Much of it must have been badly drained; flat levels of outwash silts and alluvium

* On pp. 215-27 of this volume.

were widespread and characteristic south of the York and Escrick moraines, perhaps 300 square miles below the 50 foot contour. North of the major moraine more localized levels were interspersed by patches of drift rising that critical 15 or 20 feet above the general level which tempted the pioneers to establish their farms. Such favoured sites were thickly wooded; "carr" woodland of birch, willow and alder, was perhaps more typical on the general levels with heather and gorse and some birchwoods on the sandy patches. It is these last which have survived in part to the present day. Favoured settlement sites fall into three rough categories: first along the moraines proper and on the boulder clay bench around the edge of the Vale, taking in the lower slopes of the Wolds to the east and the Magnesian Limestone to the west; secondly on high terraces along the major rivers, or the higher banks on the outer edge of meander curves; and thirdly on isolated hillocks and banks of better drained material within the Vale itself. Some measure of the opportunities awaiting the Anglian and Danish pioneers is to be assessed from the rich arable scene today, but we may imagine prolonged and arduous labour before such rewards began to be attained.

This primary colonization was a remarkably evenly dispersed one; few villages in the Vale are later in date than the Danish settlement. The "Harrying of the North" was however a severe setback. Bishop has suggested that of the 1,900 vills in lowland Yorkshire, half were destroyed and half of the remainder suffered severe losses in animals and men. The Vale of York took the brunt of this punitive campaign, and Bishop goes on to show that the developments in expansion of the "pioneer fringe" achieved by the great monastic houses in the twelfth and thirteenth centuries, represented in fact largely a *recolonization* of land once partly tamed and then allowed to revert after the Conquest campaigns. Even so, the contribution of the abbeys—and notably of the Cistercian houses—was of fundamental significance. The great sheep stations of the dales were matched by large arable farms on the Vale.

Bishop quotes figures to illustrate the impressive nature of this development. The two hundred monastic granges in the Vale in the thirteenth century perhaps amounted to more than 20 per cent of total land under cultivation. Some farms were of considerable size, 600 to 800 acres being by no means uncommon, and many of the greater granges grew to become hamlets and manors in their own right by the time of the Dissolution. As heavily capitalized, deliberately created farming units, the granges often farmed in fully separate enclosed fields from their foundations, distinct in form from the open-field villages alongside.

By the end of the thirteenth century we may surmise that, the Humber fens apart, there were few areas of the Vale proper not in use by some village community or grange. One envisages a geography

of land use in which village communities, whether inspired by lay lord or abbot, had nibbled into forest and moor edge until such "waste" land was reduced to areas essential to the working of the agrarian economy. Plague and invasion periodically disturbed this trend towards a human climax association—an adjustment of communities to each other and to their environment, in terms of space and density. The hierarchy of land ownership included also in the Vale one Royal Forest and part of another. Knaresborough Forest overlapped the extreme western edge of the Vale but lay principally on the limestone and grit uplands further west; Galtres Forest lay right in the heart of the central lowland. In the latter were reserved certain areas of standing woodland for the royal deer, but this seems to have had little effect on either the distribution of villages or their size. This re-colonization and extension of land in use which continued through the Middle Ages was principally a matter of bringing more land under the plough; farming largely for subsistence meant grain, cattle and oxen with sheep up the dales and on the fells. At the end of the Middle Ages, however, came the economic changes laying emphasis on wool-farming, and the plain of York felt the impact of enclosure for sheep grazing, the laying down to grass of traditionally arable land. The "shepe-cote in the church," although a more familiar scene on the Wolds, was not rare on the Vale itself, particularly on the better-drained sandy lands. Beresford has listed over 300 villages "lost" in Yorkshire between the fourteenth and seventeenth centuries, mostly on the lowlands and the Wolds. Today grassy mounds over collapsed walls, and overgrown sunken ways remain clearly to be seen surrounded by "ridge and furrow" in the surrounding fields where the land has remained under grass. The Wolds became and remained sheep-cropped downlands until the eighteenth century agricultural revolution.

Such occurrences as these, invasion, wastage, depopulation, belong, it may be agreed, to a past geography of Yorkshire, that is to say, one with little obvious continuity subscribing to the modern scene. From the early seventeenth century, however, can clearly be recognized trends in land utilization, sometimes dramatic in their import, which really have become part of what we see today. Several important changes coincided, in their beginnings at least, about this time; Dutch engineers began to reclaim the waste land of the fens; the Royal Forest of Galtres was disafforested and along with other manors passed into the melting-pot of speculation in land resulting in, or rather closely involved with, the rise of a new landed gentry and new ways in the countryside. In terms of more intimate detail of the landscape it should be noted that the oldest of the domestic buildings still to be found in the villages may be dated to this time. The single-storied hovel of "mud and studds" with thatched roof has completely disappeared from the villages where it was formerly typical; when it

ceased to be typical is uncertain, but the now familiar two-storied cottages with tiled roof appeared in the late seventeenth century. Above all the fields themselves changed, but before discussing the enclosure movement, a word must be said about the fens. The Hatfield moors—formerly a Royal Chase, to the south of the Humber, and Walling Fen with Bishopsoil to the north of it were dyked, drained, divided and enclosed by Vermuyden in the first instance, followed throughout the seventeenth and eighteenth centuries by Agreements and Private Acts of Parliament, thus bringing considerable areas of new land under the plough. These vast improvement projects canalized rivers, and turned marshes into straight ditches framing the depressingly flat and depressingly square fields of a size and fertility which inspired Cobbett's enthusiasm. But it ought to be remembered that for centuries previous to their drainage these moors and fens had not been empty wastes. They supported villages around their borders out of their occasional sheep pasture and all-year-round fishing and fowling. The forty-eight Commoners of Walling Fen may have had hard work in maintaining their dykes, but they stinted their cattle and sheep according to traditional common rights, and agreed in common upon open and close seasons for snipe and mallard, just as the villagers further north agreed on days for opening and closing fences into stubbles. In these highly specialized environments, there were special local rules, responsibilities and perquisites. In the Royal Forest of Galtres, where, although 'Forest' was a technical term, there were still large protected areas of standing timber, villagers had extra rights to "wodde and under wodde," and this may have been typical of other "park lands" in the county. Rights of pasturing beasts in the Forest and on the Chase were a matter of nice adjustment between the animals' need, the villagers' ambition and the royal bailiff's intention to preserve the best for the royal deer.

Outside the fens, as also within them, some drainage work must have been completed long before the eighteenth century. Ample medieval documentary evidence survives describing the preparation and maintenance of drainage ditches, and in many parts of lowland Yorkshire Commissions of Sewers in the seventeenth and eighteenth centuries represented a link in continuity of effort and purpose going back many centuries. Such effort, instigated by a variety of individuals and institutions, was directed to one end, to bring the land into use, and the hedged chequerboard of fields apparent today is the last stage in an evolution of field systems undergoing changes in agricultural practice and tenure.

Whilst it is probably true that some fields on the Vale were enclosed from their first ploughing, whether on a thirteenth century monastic grange or in land drained for the first time in the seventeenth century, by and large the classic open-field system of the English lowlands was characteristic. The national spate of enclosure acts in the period

1750-1840 included many for the Vale parishes, but to what extent the open-field system had survived substantially until this period is very much open to question. Regional detailed research into enclosures on a strictly geographical basis—that is, mapping the areas actually involved, as opposed to purely statistical inquiries—is as yet only fragmentary, and we are generally ignorant of when, or rather, in what period of the sixteenth, seventeenth and eighteenth centuries the major steps towards the modern field pattern were accomplished. One's impression is that the critical century is probably the seventeenth as far as the open fields themselves were concerned, and the eighteenth for the great expanse of moors and commons, vital to the open-field community in its prime, not so indispensable in this precise form when strips were being laid together as consolidated farms. But it was a long and complicated process, in which individual enterprise, ambition and greed struggled against the inert resistance of an elaborate conservatism of practice.

Piecemeal enclosure by grouping of strips, and taking in of commons, had been going on for some time when the tempo was quickened by the Tudor enclosures, and by the large-scale "turnover" of land following the Dissolution. After speculation in land they had never seen, London merchants sold to a new landed gentry who, if allowed, enclosed as and when they could on their new estates. Such activities came a century later in the Crown lands of Galtres, sold off in the 1620's; in these villages enclosure by the new Lords of the Manor came quickly, where it was possible, as in Farlington in 1625 and Foston in 1640, where village greens were sliced up. If such trends were characteristic—and we do not yet know—then it is reasonable that by the eighteenth century not much was left to be dealt with. In an unpublished study of West Riding enclosures, Rodgers argues that most parishes on the lowlands (e.g. the Ainsty of York) had already lost a good deal of open field. In that sector of the Vale falling into the North Riding, however, fairly sizeable areas were left to be dealt with by enclosure acts. Large blocks of common or "moor" were still unfenced by the 1750-1800 period, and even open fields survived almost entire as in Easingwold (about two-thirds in open fields in 1797) and Sutton on Forest, where the 1,300 acres of arable land open in 1756 must have represented almost all of the 3,000 strips listed in 1598. But were these examples typical? We need to know much more about the individual parishes. More confident generalizations can be made about the Wolds, where the agricultural revolution led by the Sykes, and carefully documented by Marshall, Leatham, Tuke and others of the 1790's, transformed its downland character into a great barley-growing country. This was not accomplished without some setbacks. The thin chalk soils fed by centuries of the "golden hoof" rewarded the early enclosers with virgin fertility, but a rapid fall in yields demanded the careful husbandry that has maintained them since.

The evidence on the ground today, that is the present arrangement of field boundaries, suggests a rough classification of at least three and perhaps four field types. The long narrow field, often with curving hedge lines, is a relict of the grouping of individual strips into one holding—either by exchange or purchase. It may be early or late in its incidence, but one suspects that in the Vale it is probably typically late sixteenth or seventeenth century. Ancient enclosures proper—fields which have been separate “closes” from medieval times—are usually relatively small with irregular hedge lines, no clearly recognizable geometrical shape, and often a shape reflecting minor local topographic features. Of the Enclosure Commission field plans laid out in the eighteenth and nineteenth centuries, mostly in geometrical form with straight hedge lines, the enclosures from the open fields are often rather smaller than those created by fencing in the “moor” or common grounds. These two last groups are significantly larger than the older fields.

The field systems are one of the three major elements comprising the modern landscape, the other two being the villages they maintain, and the roads and lanes linking together field and village, and village with town. The villages themselves may be studied from two or three different points of view, morphology, siting and distribution, growth and structure.

The nucleated village was and is typical of the Vale settlements, particularly the long street village, although this basic pattern has had its original simple line softened and broken by recent building. Even the pre-eighteenth century villages were, however, of various types. Some were long and straggly, especially those on the flood plain of the Derwent, others much more compact and tightly knit; some street villages were aligned along the road passing through, others at right angles to its direction compelled the road to make two sharp-angled bends into and out of the village, perhaps as Wooldridge has suggested recalling an ancient track system now superseded. Some villages have no obvious green, others have a wide street-green; others have a green at the end of the village, or even occupying the other side of the street in a single-sided village. Some villages have their cottages close up to and fronting the street, others sit well back from the road, the long narrow gardens before them being relicts of the foregarths mentioned in sixteenth century surveys. The student of settlement, whether he be a “place-name and charter man” or a “morphology typologist,” will find a primary classification straightforward; the problem comes in further subdivision, and ultimately in correlating major groups by “literary” classification with major groups in a “physical” category. This kind of question is provoked by the occasional twin settlements of two villages running together, one bearing a Danish and the other an Anglian name—there are a few interesting examples like Haxby and

Wigginton, Easingwold and Uppleby—each partner of the pair being slightly different in form. Although farmhouses began to appear in the fields from the seventeenth and eighteenth centuries onwards, the typical Vale village today still has a compact integrated look about it. Unlike most geographical phenomena it has a beginning and an end.

The distribution of the villages as already suggested is almost everywhere a function of minor differences in height. The 2½ inch map reveals the degree of intimacy with which this association operates, but no map-reading replaces the consciousness of deliberate siting gained when cycling or walking across the Vale. Apart from the obvious choice of the clay bench around the Vale, and siting in terms of flood plains and river terraces, the major moraine system across the Vale provided special opportunities, and also illustrates the familiar aversion of early settlement towards the decaying and crumbling Roman roads. From Tadcaster an important Roman road led to York and then on to Stamford Bridge—on the moraine all the way. There are fourteen villages within one and a half miles of this road along its route, of which only one is actually on the road—later revived as a turnpike and modern arterial road.

Road systems like field systems reflect changes in the social and economic climate of the times. The present road network is so complex and so far-reaching in making all habitable places accessible to one another, that we may take such an arrangement as able to conceal two or three different and historically unconnected earlier systems. It is possible by dint of a little research into eighteenth century maps, to eliminate the twentieth century accretions and to reconstruct the turnpike and ancillary systems. It takes very little practice to be able to recognize from the map the straight sharp-angled roads of the Enclosure Commissioners, and they are just as unmistakable on the ground with their thorn hedges, ditches and wide grass verges. The ability to identify these eighteenth century innovations means also ability to recognize the older thoroughfares; unfortunately it is not very rewarding pursuing the quest far back into the seventeenth century as there were few roads then recognizable as such—even if one includes the major routes from bridge to bridge and town to town.

The great Roman roads through Yorkshire stayed at least fifty feet above the general level whenever possible, on the Magnesian Limestone ridge and on the major moraines. At the other extreme of time and place, we can see on the map two separate stretches of railway line, which are absolutely straight for over 20 miles. They lie along the two axes of the Vale proper, that is along the Ouse-Ure line from York to Northallerton, and through the Humberhead fens from Selby eastwards. This modern analogy to the Roman road in its function of fast, straight movement, lies along the flattest and lowest land in the county. The development of communications in the Vale is the gradual

exploitation of all topographical advantage in a sequence bringing in ever lower and more level land as technical skill made this possible.

Just as there are fossilized field patterns, there are fossil road or rather track systems. The modern map recording with precision details of field paths and hedge lines suggests at times the answer to such questions as are provoked by villages like Sheriff Hutton, a castled village with an abortive market place, now the village green. Here the main street lies east and west parallel with the general trend of the clay bench on which the village is sited, and parallel also with the old road which does not however run through the main street, but through the "back lane" of the village. The main street is deeply sunk below the level of the cottages lining it—suggesting considerable usage, and yet nevertheless comes to a dead end. The clue lies in the field path leading directly away from a modern cul-de-sac, towards the next village a couple of miles away. Which is the older, the turnpike, now a motor road, or the field path continuing the village street?

Field paths and fields, cottage façades and church towers, winding lanes and arterial roads, are all linked in their multiple complementary function of serving a prime human need, that of making a piece of land produce food. All these features make up the landscape of the human geographer, a geography matured over many centuries, a resultant of environmental problems and of human effort. Understanding of this landscape demands careful investigation in which cautious use must be made of methods and tools normally employed in other disciplines. Examination of the terrain in detail either on the ground or in the library, field by field, and parish by parish, may not necessarily produce findings which call for radical re-assessment of original assumptions and hypotheses, but the satisfaction of knowing these are well founded might be attained, a satisfaction which too often eludes the geographer.

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The Settlement of Cornwall during the Celtic Period*

W. L. D. RAVENHILL

THE CELTIC PERIOD in Cornwall is thought to have begun during the fourth century B.C. with the arrival from the Continent of Iron Age B folk.¹ In the main these people occupied the numerous ancient fortifications on the Cornish hills. The later part of the Celtic period can be considered to have begun about A.D. 410 when Emperor² Honorius sent his now famous warning to the cities of the Britons exhorting them that henceforth they must look to their own salvation. The Celtic people of Britain who had for the most part lived outside the world of Romano-British wealth and privilege survived the catastrophe. The Greek Zosimus further records how "all Armorica and the other provinces of Gaul imitating the examples of the Britons, set themselves free in like manner; expelling the Roman governors and setting up a native form of government at their own liberty." It would appear that the country came at once into the possession of several Celtic chieftains, who rose to power, either as elders of tribes according to a system of clanship, or from their activity in resisting the numerous invaders who made their predatory raids on the coasts of Britain at this time.

The main new feature of the cultural setting in the southwest of Britain during the so-called Dark Ages was the great religious awakening which occurred towards the end of the Roman period and which flowered into the golden age of the Celtic church in Cornwall during the four centuries which followed. The lost history of this golden age must have been largely maritime. There is abundant evidence in the *Lives of the Saints*³ that frequent use was made of the western seaways which linked the peninsula of Brittany to southwest England, Wales, Ireland and Scotland. Such intercourse is now a well-established feature of prehistoric times. Activity along the western seaways was found to be most in evidence when political conditions in the Lowland Zone of Britain were disturbed. Such disturbed times occurred during the period c. A.D. 410 to 600 when the English were invading Britain from the continent.⁴ Along the western seaways travelled the Celtic saints and in this way Cornwall came within the range of their missionary activities. The native-born saints of Cornwall bear but a small proportion to those of foreign extraction. Cornwall cannot claim

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* Hitherto, it has been generally believed that it was the English who, by clearing the forest, settled on the valley floors and that Celtic settlement kept above the valley bottoms. This study attempts to show that these ideas are too rigid and need revision in the case of Cornwall.

to be the land of saints in the same way as either Ireland or Wales, but these visitors from overseas became so completely naturalized as to be spoken of as Cornish saints. Of their secure and comprehensive hold upon the religious life of the Cornish people there can be no doubt as from one end of the county to the other the impress of Celtic Christianity can be clearly traced. Of the 254 parishes of Cornwall 42 are of recent formation, since 1800; 10 are parishes surrounding town churches of medieval origin; Falmouth dates from 1661; 28 are manorial chapels of Saxon or Norman origin; the remaining 174 are Celtic. Though the forms this Christianity developed may have been local and unorthodox, requiring correction as was the purpose of the visits of Saint Germanus, there is no doubting its sincerity and popularity and the truly large contribution it made to the sum of this world's goods.

It was eventually the rise of Wessex which led to the collapse of Cornish political and religious independence. By A.D. 800 the English were in possession of the whole of Devon. About A.D. 835⁵ the Cornish rose against King Egbert who inflicted upon them an overwhelming defeat after crossing the Tamar. His political arrangements included the granting of three large estates to the nearest English bishop, whose see was at Sherborne, which were to constitute the strongholds and endowments of Saxon missionary enterprise among the Celts. It was perhaps the zeal with which they carried out this missionary activity which induced Kenstec, bishop elect of the Cornish people, whose monastery was at Dinurin, to submit finally to English ecclesiastical rule. A copy of a letter from Kenstec is preserved in which he professes his obedience to the church of Canterbury and declares his faith to Coelnoeth Archbishop of Canterbury A.D. 833 to 870.⁶ Some years later the devastating invasions of the Danes drove all the bishops of Wessex from their sees and these remained vacant for seven years. In 909 Edmund the Elder founded a bishopric for Devonshire with the see at Crediton. To Eadulph, the newly appointed bishop, were assigned the three Cornish estates,⁷ "From which year by year he might visit the Cornish people in order to extirpate their errors." Until this time, it appears, they had persisted in their opposition to English and Roman ecclesiastical discipline. These were, however, only half measures and it was King Athelstan *c.* 938 who completed the religious and political conquest of Cornwall. It is in his reign that the Celtic period in Cornwall comes to an end.

The period which elapsed between the departure of the Romans and the arrival of the English on the Tamar witnessed a great change in the settlement pattern of Cornwall. The distinction normally drawn is that between the dwelling of the hill-fort type and the settlement pattern which subsequently emerged, the outline of which can be reconstructed from the entries in the Domesday Book. Considerable light is thrown upon the process by which these changes came about in a study of a characteristic peculiar to the Celtic church. Among

Celtic scholars there is now general agreement that ancient churches lying within the sphere of Celtic influence were actually founded by the saints whose names they bear or by some of their immediate disciples. Dedication during the Age of the Saints in Cornwall signified ownership of land on which religious communities were set up: these were the forerunners of our present churches. It follows, therefore, that many of the churches and holy places in the county must date from the fifth, sixth and seventh centuries, for it was in this early period that most of the saints alluded to flourished. The dedications have, however, been checked against the pertinent documentary and other sources of evidence relating to them,⁸ and such an investigation revealed some 208 sites to be of early origin. These, at least, clearly represent settlements which were in existence in the Celtic period, the sites of which are of great interest in that they make possible a partial reconstruction of the kind of settlement which made up the landscape of Cornwall in this remote period.

The British ecclesiastical organization in Cornwall as in Wales was monastic. Raleigh-Radford⁹ found that in Wales two types of ecclesiastical settlement could be traced in the earliest records of the Celtic church. "The more important, the monasteries in the stricter sense, were often large communities, in many cases situated near the more important settlements." These were the schools and centres of learning from which missionary activity was carried out. In Cornwall there is evidence in the Domesday Book which indicates that monasteries similar to those of Wales existed before the Conquest, some of which, such as St. Petrock's at Bodmin, held considerable areas of land *Tempore Regis Edwardi* for which they never paid geld. There are other churches which though not mentioned in the Domesday Book, likewise, from the earlier documents, exhibit signs of a monastic character. Benefices of several such churches are found attached to lands adjacent to them and which, although in lay hands, seem to indicate a former monastic condition. Henderson found 80 such churches which he considered as having been of this monastic type. The second type of ecclesiastical settlement found in Wales by Raleigh-Radford¹⁰ can "best be described as hermitages in which individuals or small communities sought remote and lonely refuges, where they could serve God and live frugally on the produce of their labour." There is little doubt that the Celtic churches showing no signs of ever having been monastic in character, in the stricter sense, were of this type.

In the period when there was considerable maritime activity along the western seaways it would be natural to expect a development of habitation sites on or near the coasts. Celtic churches do occupy a variety of coastal sites. A few are near sandy coves facing the open sea and were in all probability points of disembarkation or departure. It was, nevertheless, the estuaries which were the main avenues through which civilizing influences reached the southwest of England

at this time. The Hayle estuary was the landing point of a group of Irish missionaries as is indicated not only by the traditions preserved in the *Lives of the Saints* but also in the distribution of dedications to Irish saints which are to be found in this area. Likewise, the Padstow estuary must have been of considerable importance as it is alongside this large inlet of the sea that similar evidence can be found to indicate the arrival of saints from Wales. Both the Hayle and Padstow estuaries were the Atlantic termini of the transpeninsular routes which led from the "Channel ports" of Mount's Bay and the Fowey estuary. To these centres of maritime activity must be added the extensive estuaries of

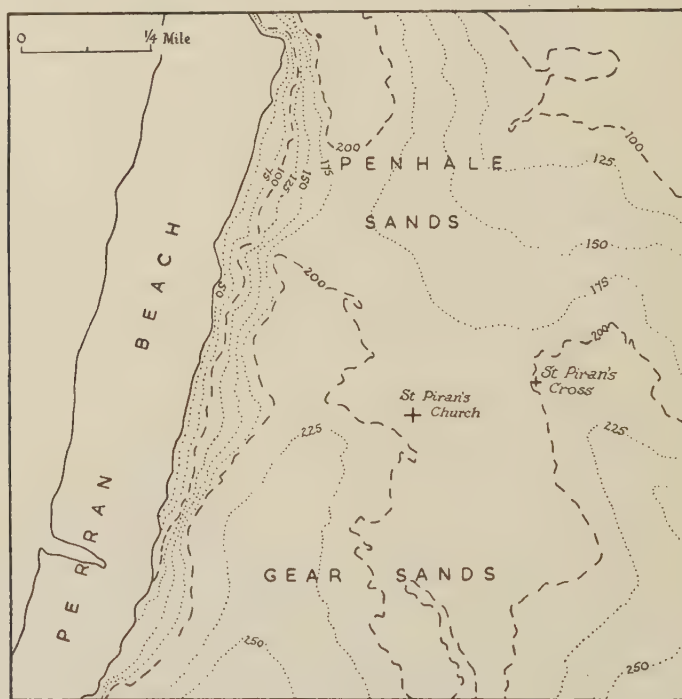


Fig. 1.—Perranzabulo.

the Helford river and Carrick Roads, in the many creeks of which several Celtic churches are to be found concealed and out of view from the open sea. In Perranzabulo sand has blocked the entrance to a former estuary, and subsequent movement of the sand has preserved what may be one of the earliest churches in Britain. The church as illustrated in the contour and water map, Fig. 1, was in the former valley bottom concealed from the sea by a north to south ridge. When the sand encroached on the church c. 1150 a new church was built near St. Piran's Cross. Seldom can any movement of churches be detected in Cornwall and in this case where it was absolutely necessary to move the church the new building was erected on the most easterly point of the original church land.

As in other Celtic lands monasteries were built on islands situated off the coast. It may have been a natural precaution to land on such islands in the days when travellers might be suspected as outlaws and robbers by churlish inhabitants. Since, however, Celtic monasteries belong to a tradition emanating from the hermits of the Theban desert in Egypt and passing by way of Gaul to Britain, the secluded island monasteries off the Cornish coast are in the same tradition as those on islands off the Côte d'Azur. Excavations at Tintagel¹¹ have revealed the existence of a community of monks of this type living on the "island" c. A.D. 500 to 800. Probably one of the most interesting features revealed is the existence of a farmstead which antedates the building of the monastery and the subsequent erection of a medieval chapel over the foundations of the Celtic monastery. This clearly indicates that in some cases there could have been no distinction between the sites chosen for secular and religious settlements and that once a site was used for ecclesiastical purposes and became hallowed its religious tradition was maintained by the building of subsequent churches on the very same site.

An investigation of the 208 Celtic sites in Cornwall reveals that the kinds of inland sites chosen by the Celtic saints were often repeated. It was found that several of the churches were on spurs, particularly those which formed interfluves. It will be recalled that the use of spurs as habitation sites was a frequent practice during the Iron Age, many hill-forts being located on spurs and promontories with higher ground rising beyond them. Such hill-forts have already been described as the "hill slope type"¹² of Iron Age camp in which the main defences face uphill, the entrance being on the lower side suggesting that the interests of its occupiers lay downhill. It has been suggested that one such hill-fort¹³ when it ceased to function was settled in the Dark Ages by farmers who modified its defences to suit their own peaceful purposes, indicating quite clearly that the tradition of settling on spurs was by no means extinct. Since the monks of the Celtic period lived in groups of huts surrounded by a rampart¹⁴ (the *vallum monasterii* which was considered desirable to separate the community from the outside world), some of the forts which have been provisionally assigned to the Iron Age may belong to this later period. A site which strongly suggests this possibility is St. Nun's chapel, Fig. 2. Three other Celtic sites are within the ramparts of earthworks which have been provisionally assigned to the Iron Age. This suggests that the settlement of the later Celtic period does not constitute a sudden and entire break with the practices of the past. Certain settlement features which existed in Iron Age B times in Cornwall must have lived on throughout the Roman period and reblossomed in post-Roman times. Some of the Celtic saints would naturally set up their churches where the Celtic peoples lived; this would explain the occupation by them of so many spur sites.

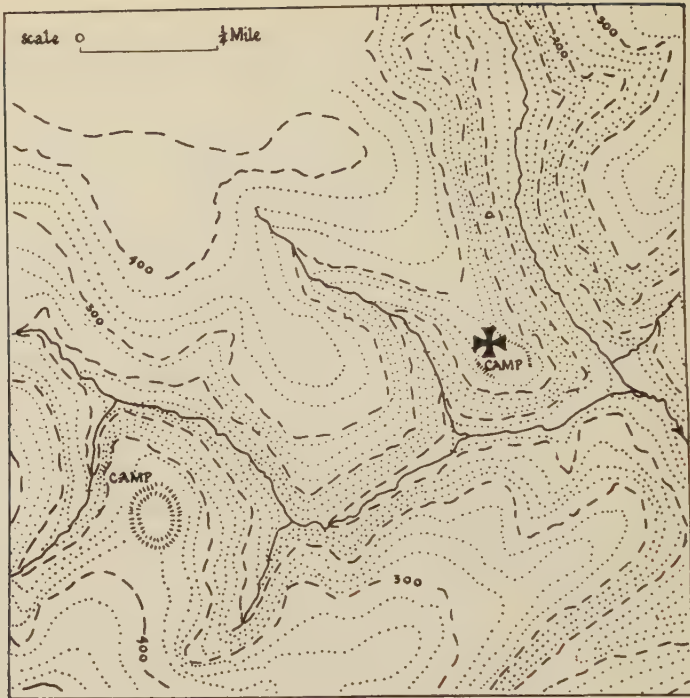


Fig. 2.—St. Nun's Chapel.

Many Celtic churches are found in the heads of valleys, either near the source of a stream or on the amphitheatre-shaped valley side overlooking the spring or source. A reasonable explanation of the frequent choice of such sites is that the dwellers thereon were interested in the supply of water. Reference is made frequently in the *Lives* to the ability of the saints to draw water from the ground through their supernatural powers, while their close association with wells and springs is well known. After *c.* A.D. 500 the climate again improved with weather conditions becoming warmer and drier. This must have had an adverse effect on the water supplies of the more upland settlements and would have tended to make them no longer adequate for their fifth and sixth century folk. This may have been one of the many reasons which led to the arrangement of dwellings outside the fortified villages. Like the spur sites these valley-head sites may represent the initial stages of the valley-ward movement of population. What became one of the more important of the Celtic monasteries is to be found in such a valley-head site. Bodmin (Fig. 3), a monastery associated with St. Petroc, is on the north bank of a small east to west flowing tributary stream which joins the river Camel, the latter in turn finding its way to the sea through the Padstow estuary. The *Gotha Vita Petroci*¹⁵ gives the following description of the site.

“For it is in a valley, lying in the middle between two mountains, well watered by springs, and suited both for corn growing and for

pasture . . . in this place, as in process of time brethren were multiplied he (Petroc) constructed two habitations, one upon the tumulus to the north and the other where Wronus had lived, in the valley by the well."

The date of the *Vita Petroci* is uncertain, but even if this is not a genuine description of the site in the Age of the Saints it must preserve the memory of much relating to the condition of the landscape in the Middle Ages. This section of the *Vita Petroci* also describes the way in which Petroc left his earlier monastery at Padstow and "traversed the least known districts of the wilderness and came to the illustrious

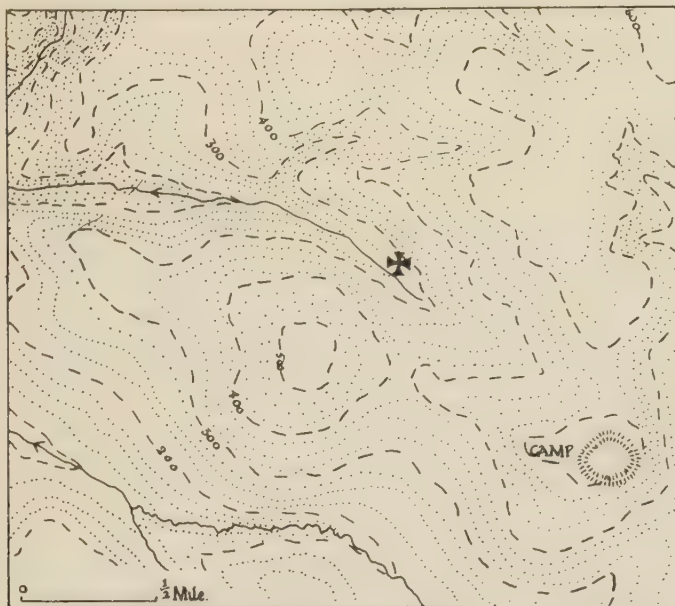


Fig. 3.—Bodmin.

wooded valley" in which now stands Bodmin. Since the Celtic period was one of considerable maritime activity first contacts with the mainland were made in the estuaries and subsequent movement must have been up the valleys. Settlement therefore may well have been both of a down-slope and up-valley nature at this time, as there are several Celtic sites similar to Bodmin in places which could be reached most satisfactorily by such an up-valley movement.

The occupation of land in the valley bottoms was also undertaken in the later part of the Celtic period. A good example of such a site being cleared of forest and occupied is the present St. Kew, Fig. 4, a small village in northwest Cornwall. The church is on the sunny, sheltered north bank of a small stream flowing from northeast to southwest to join the river Camel. This small stream washes the south side of the churchyard near which is the holy well. It is fortunate that

St. Kew is referred to in the seventh-century *Life of St. Samson*, not only "the earliest but the most authentic of any of the Lives of the Saints in Wales."¹⁶ The *Vita* relates how Samson left South Wales and "after a prosperous voyage arrived at the monastery which is called Docco." This monastery took its name from "Bishop Docco a holy Abbot of the Britons" whose death is recorded in the Annals of Ulster in 473. The geography of the events described is strikingly correct. Once again arrival in the very well-known Padstow estuary and movement up the valley to the church. Roscarrock,¹⁷ writing of events known to him in 1560, before the Reformation had removed entirely all the

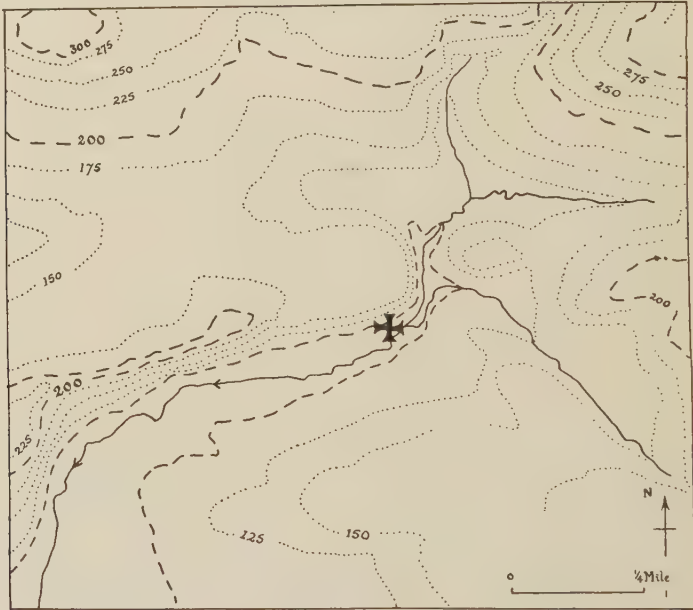


Fig. 4.—St. Kew.

vestiges of ancient Cornish practices, explains in what way St. Kew eclipsed Docco, by which latter place-name this spot was known until 1440. St. Kewa was the patroness of a chapel in the churchyard of Docco, a chapel which became absorbed into the church and whose patroness subsequently gave her name to the church and parish. In a charter of King Edgar's reign 955 to 975 the present St. Kew is referred to as Landoho when two carucates of land were given to the canons of Plympton. Subsequently in the Domesday Book it is called Lannohoo, a thriving manor which the King had acquired. "Twenty-two teams can plough these, thereof the King has in demesne one hide and two ploughs and the villeins four hides and twenty ploughs." Furthermore, a number of ancient crosses surrounding the church point to its importance in Celtic times. A pillar stone found in the wall of an old building adjoining the church and inscribed with both Latin and Ogham scripts assists in dating the occupation of the site to the

immediate post-Romano-British era. St. Kew, a valley-bottom site, thus becomes one of the earliest recorded places in Cornwall which can be identified with certainty.

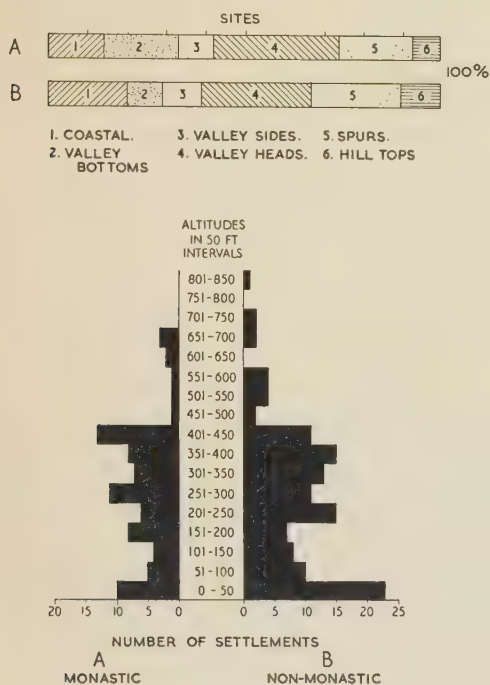


Fig. 5.—Altitude and site analyses of Celtic ecclesiastical settlements.

between the sites of the ecclesiastical and secular types of settlement since Raleigh-Radford has discovered in Wales that the monasteries proper “were near to the more important settlements.” If this is the case it is possible to imagine what the fuller Celtic settlement of Cornwall at this time resembled. If the coastal sites are disregarded as they were closely associated with the maritime activity and were special to the Saints’ culture—*island monasteries*, prayer cells near the coast and embarkation cells—then the most favoured types of site were those in valley heads and on the spurs. These were correspondingly where many of the descendants of the Iron Age B folk must still have been living and this adds further support to the view already expressed that many of the saints went where the Celtic people lived. The least favoured sites were on the hill tops and valley sides.

St. Kew is one of the many sites in valley bottoms which can be assigned as occupied during the pre-English era in Cornwall. This is a most interesting feature since the English are normally credited with this seemingly advanced cultural accomplishment. This belief has doubtlessly encouraged the view that in Cornwall in 1086 there were

Reference has already been made to two different types of Celtic ecclesiastical settlement—the monastic and non-monastic. Site and altitude analyses of these are illustrated in Fig. 5. These graphs suggest that there was no distinction between sites chosen for monastic and non-monastic settlements and the frequent intimation in the *Lives* that the hermitage type of settlement did in some cases become a monastery, in the stricter sense, is not contradicted by this site analysis. If it is established that there was no difference in types of sites between the monastic and the non-monastic dwellings then it would appear as if there were no great differences existing

two distinct types of settlement.¹⁸ There were the very large villas with numerous plough teams considered to be the Cornish counterpart of the typical English nucleated village. These are situated "in the river valleys or on the coast and have the English ending -ton—e.g. Winnenton, Tewington, Gluston, Carneton, Bennarton etc." The settling in valley bottoms and in the coastal regions has been indicated as having been already undertaken by the Celtic people and was therefore by no means exclusively practised by the English. Furthermore, the examples quoted were given the Saxon suffix of -ton but "no one doubts that these are Cornish words"¹⁹ and they may well represent former places of importance such as chieftains' residences in Celtic times subsequently taken over by the Saxons. It is surprising that in but one or two cases only have these large villas, hitherto considered reminiscent of the English village, survived in this form. Did they ever exist in a form comparable with the typical English village? On the map of Domesday villas they stand isolated with empty spaces around them—areas seemingly devoid of any settlement. The landscape of Cornwall in common with other Celtic lands was doubtlessly made up of clusters of homesteads.²⁰ These large Domesday manors situated where no nucleated settlements now exist must represent a group of such clusters. Such an arrangement is clearly suggested in the case of Winnenton in which letting to sub-tenants allows the individual clusters of the group to be included in the record. "From a manor of the King which is called Wineton have been taken away 22 manors which 17 thegns, who could not be separated from this manor, held T.R.E."²¹

The Domesday Book and the pre-Conquest charters make abundantly clear the wholesale expropriation of land undertaken by the English. In particular the coming of the Count of Mortain had disastrous results for the lands held by the church. Evidence of his spoliation is plentiful. Under St. Petroc²² for example there is a list of manors which he has seized, while under the Bishop of Exeter's manor of St. German's it is recorded that "there used to be T.R.E. a market on Sunday. Now its value is reduced to nothing by the market which the Count of Mortain has established near there at a certain castle of his own on the same day."²³ No less than 60 of the 208 Celtic sites are recorded by name in the Domesday Book, but this by no means represents the total as a very large number of holy places set up by the saints became manorial chapels or churches and are not specifically recorded by name in the text. Of the landowners only three possessed Celtic names. This clearly indicates that the English took over not only those Celtic lands which were on the coastal lowlands and in the valley bottoms but those on the high land as well. It is generally accepted that the English in their continental homes were accustomed to cultivate forest clearings in the valleys and that they carried this practice with them when they came to England. Crawford²⁴ has shown that in Wessex the Saxon

settlements lie along the river valleys while the remains of the Celtic villages are on the plateau above. Randall²⁵ considered that a fundamental distinction in English history is one between upland people who despised the valleys and the valley people who disliked the uplands.

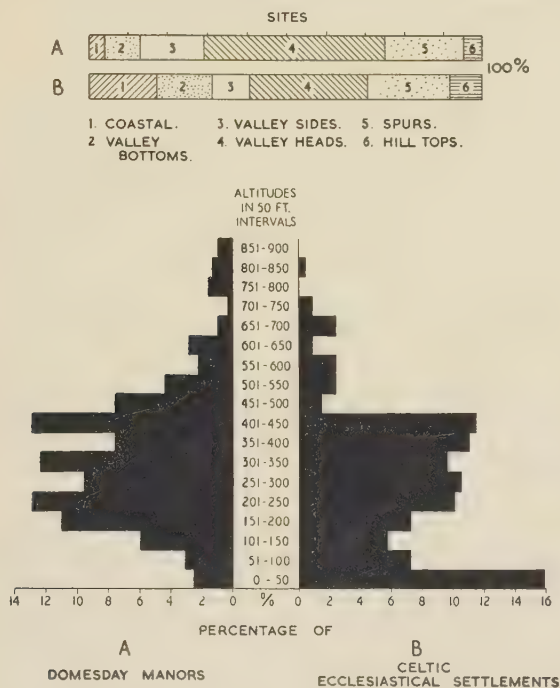


Fig. 6.—Altitude and site analyses.

Among the many factors which have influenced the evolution of settlement it is most likely that in the Dark Ages it was the clearing of the woodland which formerly clothed the greater part of the countryside which was the most important. It is, then, the existence of clearings in the forest rather than a cultural affinity for valley or hill which dictated settlement sites in Cornwall for those pioneering members of the English who ventured so far west into alien territory. If in eastern England the English invaders settled in the valleys and lowlands and nowhere else, they did not carry this exclusiveness into the Highland Zone and in particular into the well-wooded Cornish vales. These must have provided a formidable obstacle to the early English settlers and far from ignoring the Celtic clearings all the evidence suggests an eager taking-over of them—clearly an English adaptation to the changed circumstances in the physical environment of the Highland Zone. Furthermore the English when they reached Cornwall were a Christianized people. This would have made the sites of the Celtic churches even more attractive to the invaders who would be encouraged to take over these hallowed places or settle in their vicinity, particularly as the Celtic people had by this time submitted to Canterbury.

If the two types of settlement—Celtic and English—"are mutually exclusive at every point"²⁶ in Wessex the absence of this exclusiveness in Cornwall calls for a review and perhaps a re-assessment of the so-called English settlement as it has been preserved for us in the Domesday Book. Further, if the few ecclesiastical sites capable of being recognized were occupied by the English it is reasonable to conclude that a similar fate befell the remaining Celtic settlement both ecclesiastical and secular. This is precisely what site and altitude analyses of the Cornish Domesday manors reveal. These analyses, expressed in the form of percentages, are illustrated in Fig. 6. Similar analyses of the Celtic sites are included for comparison. As in the case of the Celtic ecclesiastical settlement most manors are found in valley heads and on the spurs while a surprisingly small number are to be found in valley bottoms and near the coast. This evidence clearly points to an absorption of the actual Celtic settlement by the English as well as the expropriation of their lands. There is little doubt that the Celtic period in Cornwall was a formative one in the evolution of settlement and during the fifth, sixth and seventh centuries emerged a settlement pattern which the ensuing twelve centuries have modified but not effaced.

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Lloyd's List as a source for Port Study in Schools

HENRY REES

THE DAILY NEWSPAPER, *Lloyd's List and Shipping Gazette*, price 3d., has 10 to 18 pages. Its contents include details of shipping trends, shipbuilding and marine engineering, port facilities, air services and air developments. Much of this is of geographical value. In addition it provides details of the overseas shipping of nearly 500 ports of the world and of the coastwise shipping of more than 100 British ports. For all these ports a list is given of the vessels which have just arrived, with their last ports of call, and the vessels which have just departed, with their destinations. A great advantage of this information is that its tabular arrangement is easily understandable and is suitable for analysis not only in advanced studies but also by the school child.*

There are several possible ways of using these lists for geographical study in schools. It would be a worthwhile classroom exercise merely to locate various ports on maps of suitable scale, such as those in Bartholomew's World Contoured Series, and to attach to each a figure or symbol to represent the number of vessels reported there on a particular day.

The study becomes of more interest when information is drawn from reports covering a period, say a month. Valuable lessons may then be derived from the movements of individual ships. Do they follow set routes, or do their instructions lead them to wander from port to port? How long do they take to cross the Atlantic, and how long do they remain in harbour? Such enquiries can bring the bald statements of average trade more into line with real life.

A more detailed study is possible by examining the shipping connections of an individual port. A table can be prepared to show all the ports trading with a selected centre during the month, together with the number of vessels concerned. The results can then be expressed in map form, region by region. Thus, Lloyd's lists for June, 1954 specified 374 sailings to or from the lower Medway area, of which 224 related to coastwise sailings and the remainder to overseas sailings. Fig. 1 indicates all the English and Welsh ports which traded with the area during that period. A similar map of the Scandinavian connections

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* Mention may be made too of the *Journal of Commerce and Shipping Telegraph* (daily, price 3d.). It gives shipping movements to and from British ports, but is complementary to *Lloyd's List* in that it gives detailed docking and berthing reports (for the main ports) and publishes the movements of British-owned vessels in alphabetical order of the owning companies, dealing with tankers, cargo vessels and passenger vessels separately on a particular day each week.

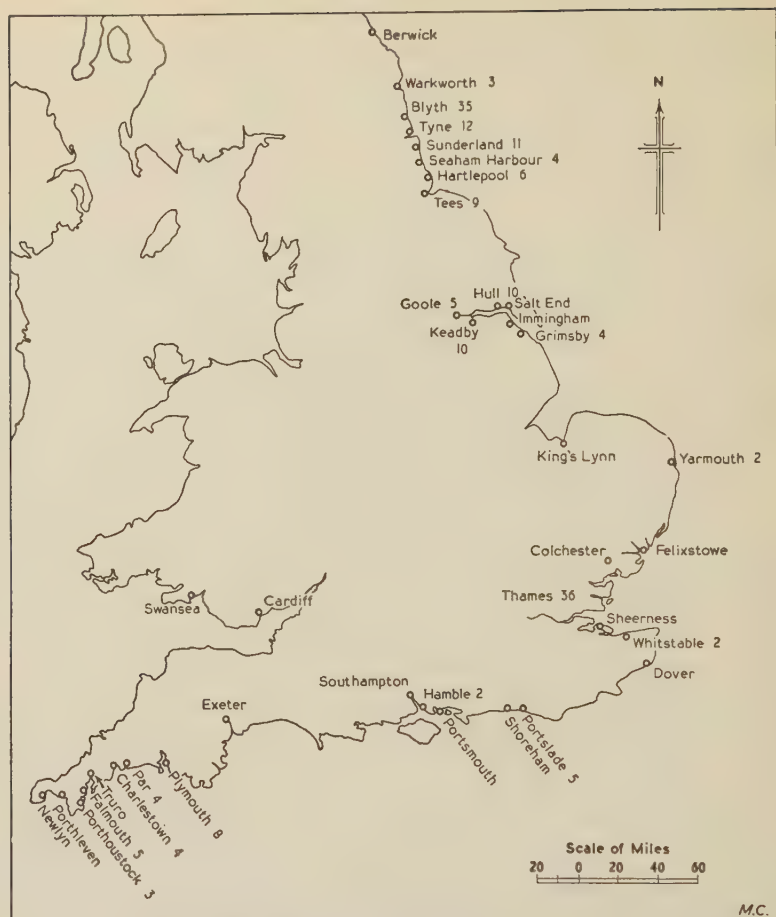


Fig. 1.—Ports of England and Wales which traded with the lower Medway during June, 1954. Figures in brackets refer to number of sailings; no figure implies one sailing. Compiled from daily reports in *Lloyd's List and Shipping Gazette*, 1st to 30th June 1954.

would show 45 sailings spread over 27 different ports. The lower Medway traded with 15 other ports in Europe, 9 in the Americas, 7 in Asia and 3 in each of Australia and Africa.

How are these maps to be interpreted? Lloyd's lists do not specify cargoes or tonnages, though they supply some of the clues; and to make the best use of the lists some local knowledge of the port activities is desirable. An important aid to interpretation lies in the fact that Lloyd's recount the ports of Britain in greater detail than does the Board of Trade in its *Annual Statement of Trade*. Thus, for the lower Medway area, Lloyd's mention separately any sailings to or from Rochester, Chatham, Strood, Snodland, the Isle of Grain, Sheerness, Queenborough and Ridham Dock (Fig. 2); but in the Board of Trade returns the first six are all grouped together to form the Port of Rochester.

This detailed subdivision is of considerable help in deciding the probable cargoes carried. Thus, the Isle of Grain, where the second largest oil refinery in Britain has recently been completed, deals only in petroleum. Crude oil from the Middle East enters and refined products depart coastwise and overseas. Ridham Dock is the private port which supplies the Bowater paper mills at Sittingbourne and Kemsley; it imports only four commodities—woodpulp, pulpwood, china clay and coal, and apart from barge cargoes it has no exports. Again, Snodland receives only china clay; that is the sole cargo which is carried by coaster beyond Rochester bridge without transhipment.

With these principles in mind it may be instructive to examine the reports published on a specimen day, namely 10th June 1954. They are shown in the following table:—

<i>Overseas</i>		Arrivals		Departures		
<i>Port</i>	<i>Date</i>	<i>Name</i>	<i>From</i>	<i>Date</i>	<i>Name</i>	<i>To</i>
Isle of Grain	7th	<i>British Vigour</i>	Grangemouth			
	6th	<i>Pacific Star</i>	Karachi			
	7th	<i>British Reliance</i>	Aden			
	8th	<i>Phoenix</i>	Mena al Ahmadi			
Strood Rochester	8th	<i>Kaap Falga</i>	Faerker	8th	<i>Angeja</i>	Ipswich
	8th	<i>Manx</i>	Kragero	8th	<i>The Monarch</i>	Rotterdam
	9th	<i>Margareta</i>	Kemi	9th	<i>Irex</i>	Las Piedras
				9th	<i>Rubicon</i>	Antwerp
				9th	<i>Lestris</i>	London
<i>Coastwise</i>						
Ridham Dock	6th	<i>Cardiganbrook</i>	Blyth	5th	<i>Fairy</i>	Keadby
				5th	<i>Richmond</i>	
					<i>Queen</i>	Blyth
Rochester	8th	<i>Capacity</i>	London	8th	<i>Crescence</i>	Tees
	9th	<i>Sincerity</i>	Falmouth	8th	<i>Signality</i>	Berwick
				8th	<i>Corfleet</i>	Seaham
				9th	<i>Capacity</i>	Charlestown

From Lloyd's report of 10th June 1954.

The list indicates the arrival of four tankers at the jetties of the Isle of Grain, a reminder that the construction of the Kent Oil Refinery has turned this area into the most active section of the Port of Rochester. No fewer than 83 sailings were reported here during the course of the month. *Phoenix* is of interest in that she carried the greatest cargo of the month, a consignment of 39,014 tons of crude oil from Mena al Ahmadi. The bulk of the crude petroleum for the refinery is received from this port, which, since 1946, has been developed as the

outlet for the Burgan oilfield in south-eastern Kuwait. Lloyd's reported 17 tankers from Mena al Ahmadi during the month. They were rarely more than a day in port, and the list of 11th June shows that *Phoenix* departed on the 9th, returning to Mena.

It is not clear why *British Vigour* journeyed from Grangemouth; but *Pacific Star* (as a later list shows) left for Karachi again on the 13th, and was no doubt supplying Pakistan with petroleum products. *British Reliance* had arrived from Aden, perhaps in ballast. Two days later she was bound again for Aden, this time probably with a cargo of fuel oil for distribution to shipping there. The last two sailings illustrate the general tendency of oil tankers to specialize on particular routes.

In Strood, *Kaap Falga* by its last port of call reveals its cargo, an unusual raw material named moler earth. According to the port authority it is quarried in this locality of Denmark; it is unloaded in Strood Dock, the only wet dock in the port, and it proceeds by rail to the uralite works at Higham, where it is used in the manufacture of fireproof and heat insulating bricks, slabs and partitions. One load a month usually arrives, in small vessels carrying 400 to 500 tons, and it represents a minor but regular import of the Port of Rochester.

In Rochester, *Manx* and *Margareta* were evidently woodpulp vessels. Kragero is in Norway, southwest of Oslo; Kemi is in Finland, close to the Swedish frontier. Kemi was as active in the Rochester trade as any of the Scandinavian ports, sending four vessels during the month. The Baltic woodpulp trade, however, is seasonal, and Kemi is one of the many Finnish ports which are blocked by ice in the winter. Both these ships remained some days in port. Their pulp would be transferred to lighters and carried upstream to the paper mills at Snodland, New Hythe or Maidstone. *Manx* departed on the 12th for Gdynia and *Margareta* on the 16th for Methil in Scotland. Both no doubt travelled light, for Rochester can offer few cargoes. Since they did not immediately journey to Scandinavia for further consignments of pulp, they had probably found return cargoes in the stated ports.

Lestris must have been another woodpulp vessel. She had arrived from Soderhamn in Finland, about 150 miles north of Stockholm. Her departure to London likewise was probably to secure a return cargo. This is quite typical of the lower Medway. Lloyd's returns for the month show that 18 vessels departed to London, while only 7 arrived from London. Yet there is no obvious cargo carried from Rochester to London by sea-going vessels. There are *barge* cargoes, but these are not recorded by Lloyd's, and the 18 vessels must have departed in ballast.

The cargoes of *Irex* and *Rubicon* in Rochester can only be guessed at; but the Queenborough departures offer more scope. Queenborough includes a glue and chemical works, a glassworks and a pottery. *Angeja* had entered on 4th June from Rotterdam, perhaps with a cargo

of glass sand for the Canning Town Glass Works. *The Monarch* arrived the following day, from Blyth, undoubtedly with a cargo of coal. There is an old-established coal wharf to the south-west of the town, with rail connections to the local factories.

This completes the examination of the overseas section of the list; it will be seen that two commodities, petroleum and woodpulp, dominate the traffic.

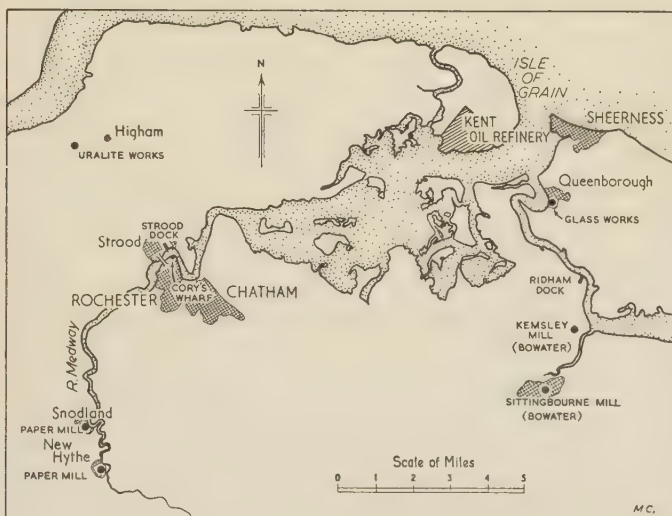


Fig. 2.—The lower Medway, showing places mentioned in the text.

In the coastwise section of the lists, only Ridham Dock and Rochester were represented. The activity at Ridham Dock can be interpreted with some confidence. *Cardiganbrook* had brought a load of coal for use in the electric power house of Bowater's paper mills, and *Richmond Queen* had arrived on the 4th, bound on the same errand. Both remained in port only a day, then returned to Blyth. Blyth with its 35 sailings recorded during the month is quite outstanding among the ports of north-east England in the trade with the lower Medway.

Fairy had arrived on the 4th from Plymouth, no doubt with a load of china clay, for Plymouth is the outlet for Bowater's quarries in Bodmin Moor. This commodity is a small but regular coastwise import into the Medway; an average of two consignments, each of 200 to 300 tons, arrives each week. *Capacity* too, in Rochester, may have been engaged in the china clay trade, for on departing she was bound for Charlestown, another china clay port. Frequently these vessels proceed directly upstream to unload at Snodland (for Townsend Hook's mills) or New Hythe (for Reed's mills); but *Capacity* may have been too large to negotiate Rochester bridge, or her clay may have been destined for mills in Maidstone which can be reached only by barge.

It so happens that on 10th June there was no report of any woodpulp vessel at Ridham Dock. Reference to the list of the following day shows, however, that *Mergus* had in fact arrived from Oulu (southeast of Kemi) on the 8th. In addition Bowater's mills receive regular supplies of woodpulp and pulpwood from Newfoundland. During the month six arrivals were reported from Indian Bay, which is the port for Bowater's great lumber mills at Cornerbrook in western Newfoundland. The Medway woodpulp cargoes are generally of the order of 3,000 to 5,000 tons.

Both *Sincerity* and *Signality* were trading between the Medway and Falmouth, for an earlier list reveals that *Signality* had arrived from Falmouth on the 4th. The names of these two ships suggest that they and *Capacity* are owned by the same company (F. T. Everard and Sons, Ltd.). Falmouth and other ports of western Cornwall send granite to the lower Medway for use chiefly in road-making. Loads vary from about 200 to 800 tons and the trade shows a distinctly seasonal character; eight or nine shipments a month are made in the summer but only three or four in the winter, probably because road-making is chiefly a summer activity.

Corfleet is a representative of an important branch of Medway commerce. She had arrived from Blyth on the 5th with a consignment of 2,396 tons of coal. This commodity is the most significant coastwise import of the lower Medway. The chief receiving point is Cory's wharf, whose regular visitors can be distinguished by the prefix, "Cor" in their names, thus: *Corfleet*, *Corfield*, *Corfoss*. They are members of the fleet of 21 colliers operated by W. Cory and Son, Ltd. During the month seven of them arrived, from the ports of Blyth, Sunderland and Hartlepool.

The remaining vessel in the day's report, *Crescence*, is one of a trio (the other members being *Insistence* and *Dominence* (*sic*)) which ply regularly between Rochester and the Tees. A total of eight sailings was recorded during the month. Their cargo consists of scrap metal, which is collected by lorry from a large part of southeast England, assembled at Lynch's yard on the right bank just below Rochester bridge, and shipped in loads of almost exactly 300 tons direct to Tees-side steel works.

Thus, Lloyd's lists show that during the month of June, 1954, the lower Medway traded overseas with every continent and had special connections with Sweden, Finland, eastern Canada and Kuwait. Coastal trade was carried on with a whole range of ports along the southern and eastern shores of Britain, from Newlyn in Cornwall to Wick in Caithness. Lloyd's lists are not in themselves sufficient to describe completely the activities of a port, but they provide clues which the geographical detective may profitably follow. With the addition of a little local information they can bring a breath of the sea into what is too often a dreary statement of imports and exports.

London's Airports and the Geography of Airport Location

K. R. SEALY

WITH THE ENORMOUS GROWTH of scheduled air services since the war* (Fig. 1), the problems posed by this relatively new mode of transport have assumed the proportions normally associated with motor traffic. Whereas all forms of transport serve similar ends, the aeroplane is the only one to enjoy the advantages and suffer the disadvantages of the third dimension, so that one cannot approach the problems it poses with a mind fixed on the ground.

Since the airliner carries man and his chattels, we should expect to find the greatest concentration of traffic between the most densely populated areas, with the airports as focal points. At the airports all traffic into an area is concentrated, and the 'freedom of the air' becomes an absurdity. London, with its enormous population and extensive commercial and cultural attractions, is an excellent example.

Factors influencing the location of airports.

Before discussing the complexity of such a modern airport as London, one might first ask why an elaborate structure covering six square miles is necessary. Although great strides have been made in the development of the helicopter, practically all scheduled air services are operated at present in fixed-wing aircraft, which have certain limitations. In the helicopter the wing is moved by rotation to obtain lift, while in the fixed-wing machine, one moves the whole aircraft. Hence the latter requires a large stretch of ground† upon which it can gain momentum, and therefore lift. Secondly, once airborne, the fixed-wing machine must keep moving above a certain speed (termed the "stalling" speed) to maintain sufficient lift.

A large aerodrome is required, therefore, and because of the size and weight of modern commercial airliners, concrete runways are essential. In addition, provision must be made not only for refuelling and maintenance, but also for the exchange of passengers from air to ground. An aerodrome providing all these things is termed an 'airport',¹ a distinction not unlike that made between 'harbours' and 'ports' in sea transport. We are concerned here with 'airports', and in particular with those serving London.

➤ Mr. Sealy is a lecturer in geography at The London School of Economics and Political Science.

* Total movements of aircraft on scheduled service at London's airports:

1938—29,245; 1949—62,903; 1952—89,026 (Total for all movements—198,705).

† Strictly the distance an aircraft needs to become airborne multiplied by two. For modern commercial aircraft this means a runway 3,000 to 5,000 yds. long at sea-level in temperate latitudes.

The locality chosen for a major airport must satisfy certain basic requirements. Physically it must be an area of low relief, with clear unobstructed approaches permitting a descent angle of about 1:50, while the field itself must be as near flat as possible in order to minimize the cost of runway and drainage construction. The surface should be capable of bearing concentrated loads, and at the same time be free from flooding. Meteorological conditions are important, with visibility the prime element to be considered. Poor visibility, particularly during peak times, will affect the traffic flow to and from the airport, and make necessary the use of alternative landing grounds and traffic 'stacking'. Fog and smoke are the chief offenders, and a site upwind of the metropolitan centre is usually more favourable, providing the local topography does not create fog pockets. The prevailing wind normally determines the direction of the main runway and often, therefore, the layout of the whole site. Rainfall and temperature are of less consequence in temperate latitudes, but it should be remembered that 20 minutes rainfall at 1 in. per hour on London Airport creates a discharge of 6,250,000 gallons. Where possible, then, sites should be chosen where rainfall is not concentrated by the peculiarities of local relief.

Economically, the site should be as near the city centre as possible, to cut down the travelling time to the airport over roads and railways already congested by traffic. This requirement conflicts sharply with the physical need for a site in open country clear of obstructions. A compromise is always necessary; in theory, marginal revenue is equated with marginal cost, i.e. where the added revenue earned by a closer site is overbalanced by the increased cost of construction and operation on such a site. The importance of rapid land links with the city centre cannot be over-stressed however. The essence of air transport is speed, and just how ridiculous the situation may become can be seen in the case of a journey between the city centres of London and Amsterdam. By the normal airline route some 2 hours 20 minutes of ground time must be added to the air journey of 1 hour 20 minutes to give an overall average speed of 60 m.p.h. This is in spite of the fact that aircraft are used which can cruise at 165 m.p.h. In general, the shorter the route the greater the importance of this ground time. On very long routes it may be regarded as negligible. It is in this context that the helicopter may be expected to play a vital role in the future.

The site chosen must be large enough not only to permit the operation and maintenance of aircraft (the aeroplane is singularly awkward on the ground) but also for the construction of buildings suitable for the exchange of passengers and goods from one element to the other. The movements involved in simply getting goods on and off a number of aircraft with wing spans of over 100 feet, and marshalling such machines to loading bays, runways, and hangars, are a study in themselves.² Further, it must be remembered that aircraft are

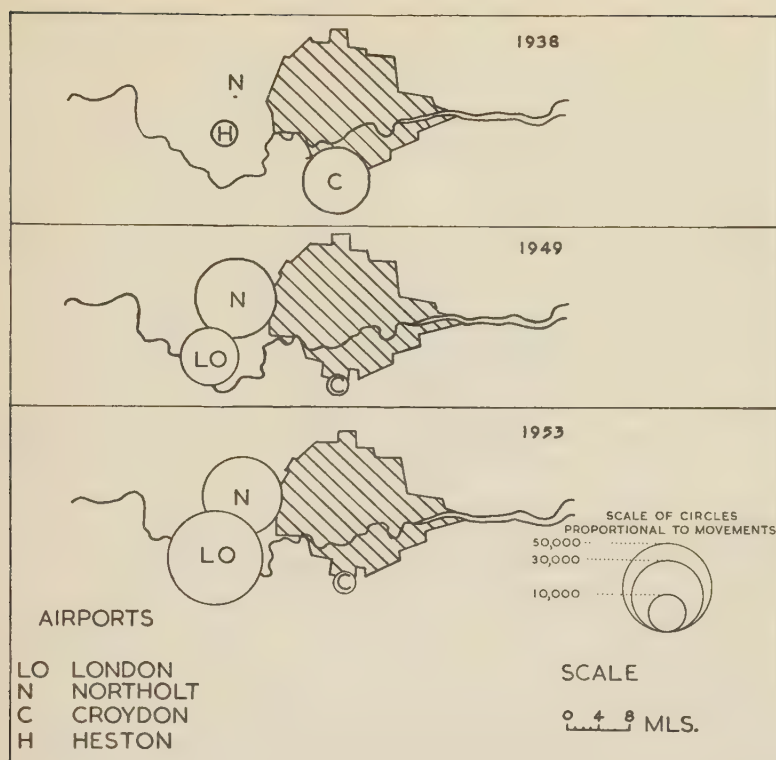


Fig. 1.—Scheduled air transport movements at the major London Airports, 1938–53.

best suited for the carriage of high value/low bulk commodities, often of a perishable nature, where speed and careful handling are the main requisites. In short, the airport must be designed from the start as an economic entity.

We may now turn to the broader considerations, which are as important as the local ones. Since the chief air routes are concentrated between the areas of greatest economic importance, it follows that traffic will not approach any given airport from all points of the compass, but will in fact converge on the field along a few well-defined directions. The site of an airport will be influenced considerably by the pattern of routes converging upon it and the site should be so placed with relation to the city area that a minimum of traffic has to pass directly over the city. Such a site not only reduces the possibility of accidents occurring over a crowded urban area, but may place the airport itself nearer the overseas centres it serves.

When the pattern of traffic has been estimated, the question arises, does the situation demand more than one airport to deal with particular concentrations? If the attempt is made to handle all traffic at one airport, the marshalling of aircraft near the airport becomes an acute problem, and a complex flying control system is

required which includes 'holding zones' where aircraft may be kept moving back and forth at different heights ('stacking') pending permission to land (see Fig. 5). Again, unless a suitable alternative airfield is available, bad weather or an accident on the main airport may cause chaos in the traffic pattern. Concentration on one airport also aggravates the problem of land links with the centre served. The whole problem is simplified if more than one airport is available, where each one can act as an alternative for the others where necessary. Such a solution appears obvious, but there are serious objections to the 'multiple unit' idea. A modern airport costs the taxpayer a great deal of money,* quite apart from the actual acreage of land consumed by the field and its ancillaries, and any increase in cost is not to be accepted lightly. It must be remembered, too, that air traffic is markedly seasonal, particularly on short routes,† so that there is likely to be a good deal of unused capacity at one or more of the airports at off-peak periods. Yet there is no escaping the fact that more than one available airport has much to recommend it. As in so many instances, it is impossible to generalize, and any particular project must be considered on its own merits taking into account not only the present, but also the future requirements of the area.

The growth of London's airports.

Historically, London's airports grew up haphazardly, and little planning was evident up to the outbreak of war in 1939. From a humble beginning at Hounslow Heath in August, 1919, air traffic into London showed little real expansion until the 1930's, when the volume of traffic began to increase the pressure on the available airports. By 1939 traffic was divided between Croydon, Heston, Gatwick, and Lympne, with Croydon taking most of the long haul services, and Heston the internal and continental routes (see Fig. 2). Since the annual scheduled air service movements totalled about 30,000,³ even these four sites were becoming over-crowded. In view of this, two government committees were set up to investigate the problem,⁴ the first favouring a ring of airports, and the second four airports for London set at the cardinal points of the compass. In addition, plans were made to expand Heston, and to construct a new airport at Fairlop in Essex.⁵

The war interrupted such plans, so that in 1945 London possessed no airport capable of handling the expected increase in civil traffic. Croydon and Heston were both small grass fields almost surrounded by urban development, and incapable of expansion. Technical advances resulting from the war made concrete runways and clear approaches even more vital. Existing sites, except for the 'outlier' at

* Cost of London Airport in first five years was £12,000,000. This sum seems likely to be trebled before the airport is completed. (Cf. Croydon—£400,000 up to 1939.)

† e.g.—Overall load factor as a percentage of total revenue flying on British European Airways routes was in September 1950, 63.5%, in January 1951, 49.7%.

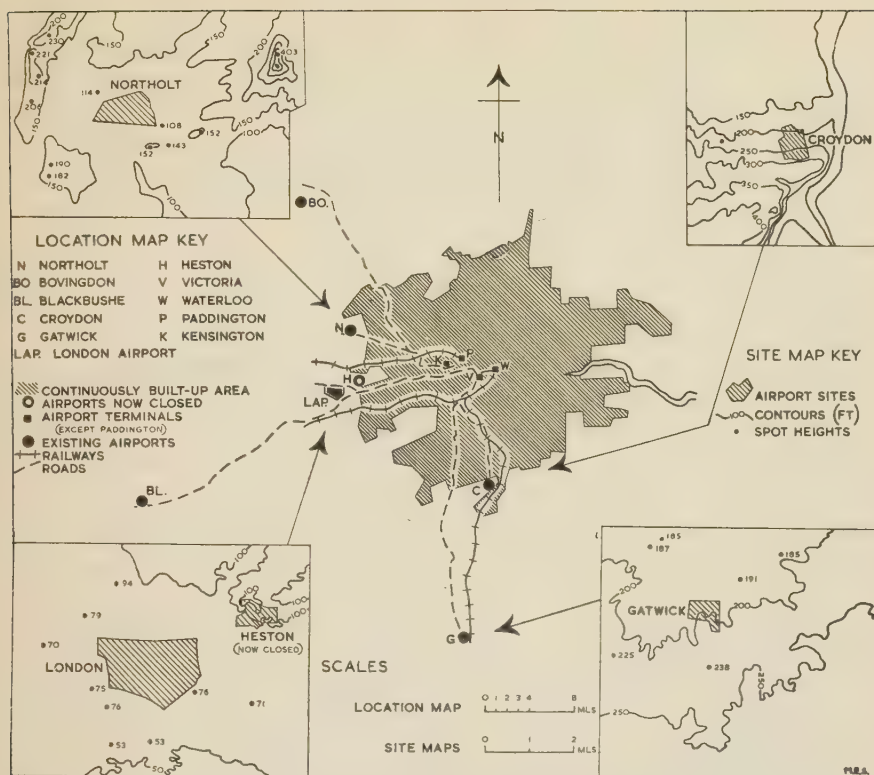


Fig. 2.—Map to show London's airport sites, and accessibility to road and rail transport facilities.

Gatwick, were totally inadequate. As early as 1943 the Heathrow site had been chosen as a transport base for the R.A.F., and as a nucleus for a post-war civil airport. Thus in 1946 the newly instituted Ministry of Civil Aviation took over the skeleton airport at Heathrow, now officially called London Airport.* Northolt was also taken over as a temporary airport in 1946 for the shorter services until London could cope with them. The transfer of traffic began in 1953 and was completed in October 1954.† Originally, London Airport represented an attempt to solve the problem of air traffic into London by means of a single main airport and, although the plan to expand Gatwick represents a recent modification, concentration upon the single site is still the key to the situation.

London Airport.

We may now consider how the findings of the first section of this paper apply in the case of London Airport.

* Ministry set up under Ministry of Civil Aviation Act 1945. Heathrow taken over in January, 1946, and named "London Airport" in March. Civil Aviation has, since 1953, come under the jurisdiction of the Ministry of Transport and Civil Aviation.

† The last scheduled service left Northolt on 30th October, 1954.

The traffic flow pattern must be the first consideration, and a study of the pattern will reveal the areas where possible sites should be sought. For London most traffic approaches from the south and southeast, with a growing intensity from the west, and northwest (see Fig. 3). Thus a site south or west of the urban area offers the best solution from this point of view. In fact, after considerable discussion, the Heathrow site was chosen west of London (Fig. 2).

Physically, Heathrow possesses a number of distinct advantages. It is situated on the broad expanse of the Taplow Terrace of the Thames, at a point where there is practically no relief, and gradients are extremely low (Fig. 2). The area of the airport itself lies some fifteen miles from the centre of London, and was taken over from essentially market gardening land, so that little demolition of existing buildings was necessary. The terrace gravels, which are here from 15-25 feet thick, provide not only a good bearing surface, but also large quantities of uniform aggregate highly suited to the production

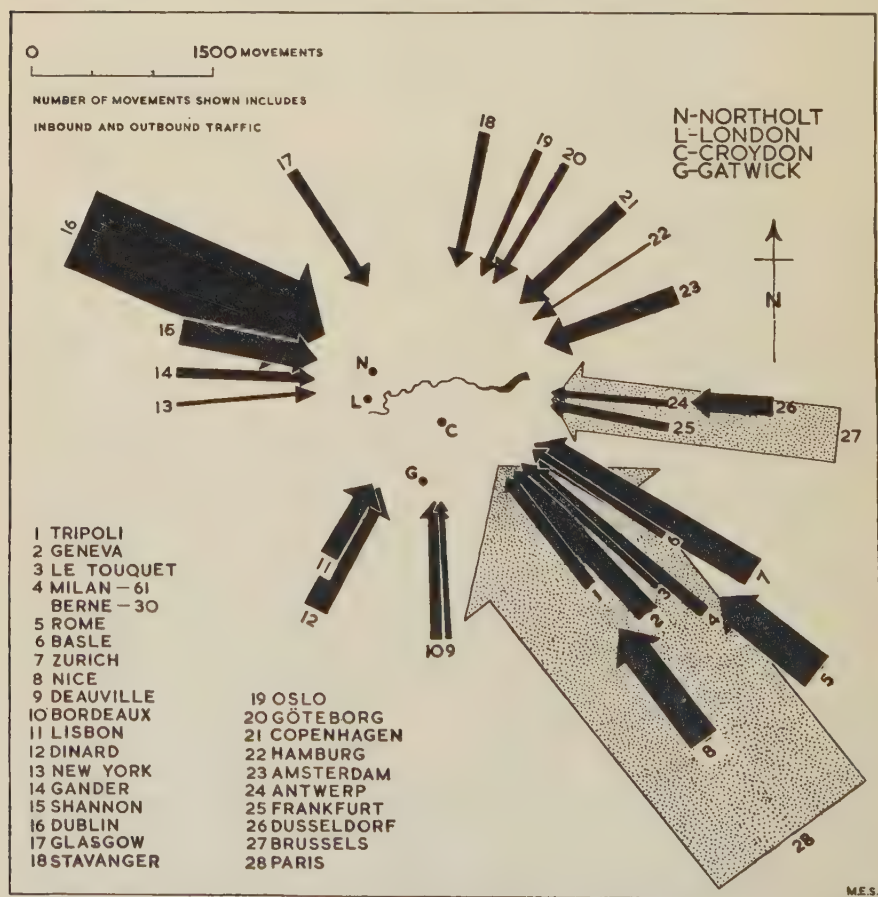


Fig. 3.—Volume of traffic using London's airports in September 1950. The scale refers to width of arrows. (Based on I.C.A.O. Statistical returns.)

of concrete,⁶ a combination of features possessed by no other site comparably situated from the centre of London. Although closely approached in the east by urban development, there is little obstruction, since most of the buildings close to the airport are of only two storeys. We might note, perhaps, that noise has proved to be a problem, as local protest has vehemently demonstrated.

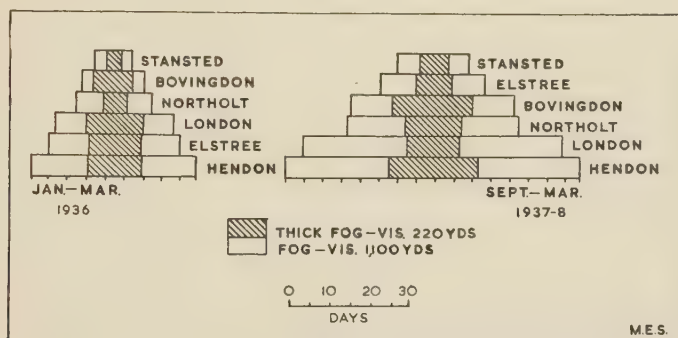


Fig. 4.—The incidence of fog at aerodromes west of London. (Based on the Stansted Airport Weather Survey.)

The site's chief disadvantage is a meteorological one, for, as Fig. 4 shows, it suffers from poor visibility compared with areas nearby, and the incidence of fog is considerable. With the growth of reliable radio and radar aids coupled to a planned system of flying control, such a disadvantage loses much of its force. Apart from this, there is the question of the high water table (4 feet from the surface), which was successfully overcome during the construction of the airport. The Heathrow site seems a good compromise, and satisfies the more stringent requirements reasonably well.

So much concentration upon a single airport brings forward the question of land links with the centre of London. The choice lies between the helicopter, or road and rail transport. London Airport is not situated near any main railway line (Fig. 2), and any spur to the already crowded Western Region line through West Drayton, or the Southern Region line through Staines, would pose difficult problems. The extension of the Piccadilly line from Hounslow is even less attractive, for with 15 stops to London, and little baggage accommodation, this service would soon be completely congested, quite apart from the time taken on the journey. The construction of a new tunnel or even an overhead railway would be extremely costly.* The possibility of a helicopter taxi service from the South Bank site, near the Waterloo Air Terminal, has also been considered, although the present plans for the development of the South Bank do not make provision for a helicopter stop. The use of the site by helicopters was made possible by Government action in June 1954 with the reservation

* Estimated cost of Underground extension—£1,250,000 per mile.

that it would not constitute a permanent "rotor-station". No doubt in anticipation of eventual scheduled operations, both British European Airways and the Belgian airline, Sabena, have conducted trials from the site. However, it seems doubtful whether such a service can cope with more than a fraction of the traffic, at the present stage of helicopter development.

Road transport must then bear the brunt of the traffic, at least in the immediate future. The airport is served by the Great West Road and the Bath Road, both still handicapped by the bottleneck at Hammersmith Broadway. The time already wasted on the ground is serious, and with increasing air traffic demanding more road space, together with an increase in motor traffic generally, London Airport is in danger of becoming paralysed. By contrast, Gatwick is an example where the railway provides the main link, and, in spite of its position, is within an hour of London by fast train.* The proposed extension to Gatwick, and its subsequent increase in importance, should provide an interesting contrast to London Airport.

The heavy concentration upon London Airport has the advantage that expenditure is restricted to one main site, with attendant benefits to maintenance and cargo facilities. Perhaps one should say that the cost of a modern airport of this size is such that only one site is financially possible. On the other hand, secondary fields acting as alternatives to London appear necessary in spite of modern flying aids. Temporarily, Bovingdon, Blackbushe, Stansted and Hurn serve as diversion fields, none of them remotely comparable with London. Recently,⁷ the expansion of Gatwick has been decided upon, and work on this airfield is expected to begin shortly. The object of the expansion is threefold: (a) to develop the site as the main alternative to London Airport; (b) to take over some of the shorter Continental and Channel Island services from London, especially those that operate at seasonal peaks; (c) to be a base for charter companies. It is hoped that the first stage of the proposed expansion will be completed by 1958. In addition it is proposed to use Blackbushe as the second alternative airfield, with Stansted as a future reserve. Bovingdon, Croydon and Hurn will then cease to rate as alternatives.

Finally there is the question of the marshalling of traffic in the air space near the airport. With the establishment of the National Airways Plan in 1951 (Fig. 5), the control of aircraft near London has become more effective. Briefly, traffic is channelled along 'airways' by radio to a 'holding zone', and filtered from there to the airport. Now Northolt has gone out of use, the system will become simpler, and the presence of two streams of traffic at close quarters will be eliminated. Nevertheless, the system is still delicately balanced. Concentration on London Airport necessitates the rigid control of aircraft entering the zone, especially in bad weather conditions. Not only does this mean

* Cf. coach time from Victoria Terminal to London Airport which takes 55 minutes.

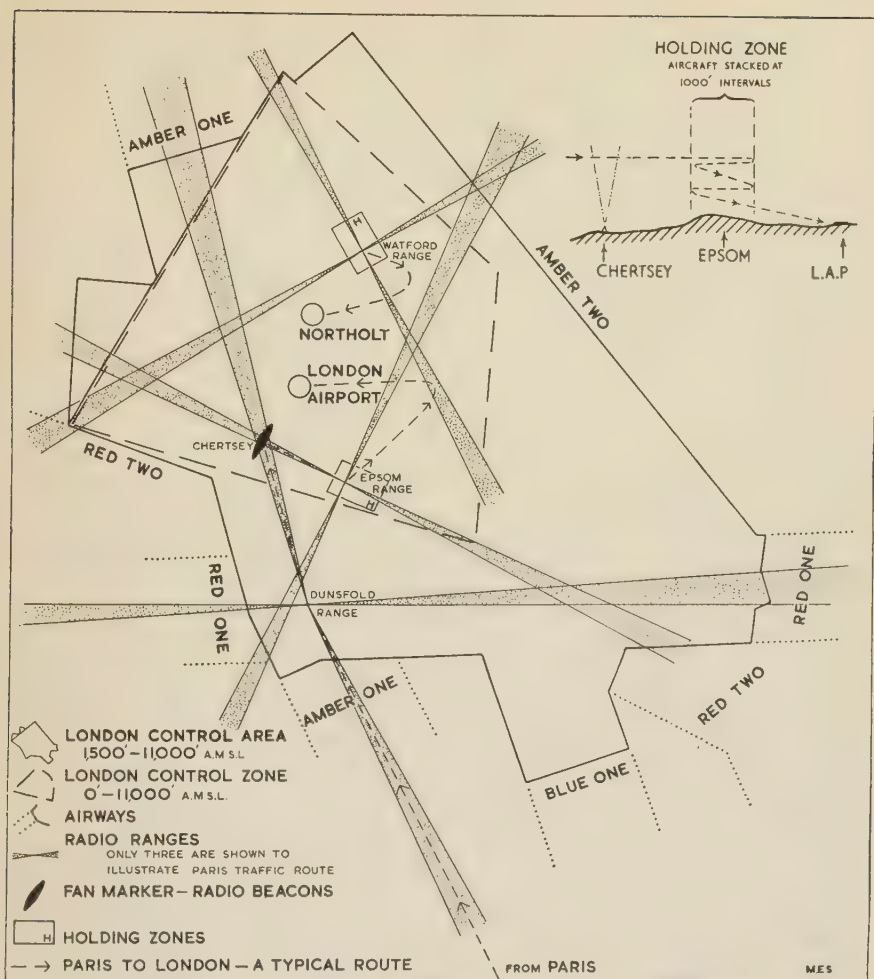


Fig. 5.—The British Airways Plan, Phase 2. The map shows only the radio ranges commonly used on the Paris–London route.

that time is lost while aircraft are held in the holding zone, but it also increases the operating costs of the air lines. With the advent of the jet airliner* with its high fuel consumption, prolonged stacking in a holding zone is wellnigh prohibitive, and this fact, together with the previous evidence, would seem to indicate a precarious position which may necessitate a much greater use being made of Gatwick, or some other alternative site, in the future.

To summarize the position, London Airport appears well sited, but whether it can cope with the increasing volume of traffic without any substantial aid from other airports seems problematical. In this respect the Gatwick plan has much to recommend it, for this airfield

* First "Comet" jet liner service operated on 2nd May, 1952, to Johannesburg. Service withdrawn 9th April, 1954, as the result of two accidents to Comet aircraft.

is advantageously placed to handle Continental traffic and to act as a first alternative to London. We should remember, in conclusion, that all present development is based on the assumption that the landplane will remain the chief instrument. Recent advances in the design of the flying boat, together with its known appeal in transport work, suggest that the present ascendancy of the landplane is not necessarily permanent.⁸ Still further ahead lies the possibility of reducing the take-off distance required by aircraft with the ultimate aim of a vertical, or near vertical take-off. This in turn will profoundly affect the layout of international airports.

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Exploration in the Cairngorms

The 1953 Cairngorm Weather Survey

M. W. DYBECK

IN A SENSE THIS ARTICLE is complementary to one of the same title by Mr. Robin Murray in *Geography*, vol. xxxix, April 1954. His article described work which was primarily educational and which was carried out using Glenmore Lodge as a base. This article concerns exploration in which the emphasis was more on original and useful field work and in which the participants were camping the whole time.

The chief scientific aim of this exploration was to study mountain weather conditions. Comparatively little is known about mountain weather partly because few people have ever had the energy or enthusiasm to make meteorological observations in such difficult country. Before 1952 the only systematic observations made above two thousand feet in Britain were from two stations; one on the Pennines,¹ and another on Ben Nevis—which has been defunct for over fifty years.² The Cairngorm mountains of Scotland therefore presented a great opportunity and a challenge to advocates of schoolboy research. They are the largest mountain massif in Britain and yet no weather information had ever been collected from them. The discovery of facts about Cairngorm weather could be of more than local interest, and a series of carefully sited stations could yield much information applicable to mountain regions in general. The technique of making weather observations would mostly be familiar to schoolboys and all that prevented an immediate launching of the scheme was the uncertainty whether it would be physically possible to establish and maintain stations under such tough conditions. So, in 1952, a reconnaissance party of Cambridge University Rover Scouts established five high altitude camp sites, at which weather observations were made, and concluded that, with sufficient training, here was a job which senior schoolboys could profitably undertake.³ In 1954, the ten weeks' survey, involving King's College, Taunton, Perse School, Cambridge, and three universities, proved that living on Britain's "climatic fringe" could be just as adventurous as many an Arctic expedition.

The scientific work carried out during those ten weeks was not exclusively meteorological. Weather readings only occupied one man for a short while every three hours or so but, as it was necessary for safety, morale, and other reasons to have at least four people resident at each camp, there was plenty of time for other activities. Making the camps comfortable and well supplied with food was one of the

► Mr. Dybeck, who was the organizer of The 1953 Cairngorm Weather Survey, is Chief Instructor at The Brathay Hall Centre, Ambleside.

main occupations during much of the "summer"—a season which gave us almost everything unpleasant except snowstorms—but in the first three weeks of August, when the weather stations were taken over by Rover and Senior Scouts of King's College, Taunton, a large programme of original field work was added to the meteorological work. This programme included the sounding of Loch Avon and Loch Einich—probably the largest unsounded lochs in Scotland, the mapping in detail of the near-permanent snow patch, called Margaret's Coffin, on Cairn Gorm, and the surveying of plant communities on parts of the high plateau.

To carry out such an extensive programme of field work, it was necessary to give much thought to all three stages of the expedition; the training, the work in the field, and the writing up.

1. *Training.* The King's College expedition was planned through the school's Scout organisation. While this is not essential, it has the great advantage that most of the problems of leadership and elementary campcraft are automatically solved. But, however good the Scout Group, expeditions of this kind demand a knowledge of camping conditions far tougher than even they could be expected to have come across in normal training. Their camp on Dartmoor, the previous January, was therefore no "optional extra" but an essential part of their preparation for the Cairngorms in August.

Besides training them in living happily under adverse conditions, in mountain safety, and in First Aid, it was necessary to see that the boys were thoroughly grounded in the field-work techniques which they would use. Here it was possible for people to specialize a little. Everyone had to be a capable weather observer, but only a few people needed to be competent plane tablers or botanists. All field work to be undertaken had been chosen because it involved almost exclusively skills which a schoolboy could easily learn.*

2. *Work in the Field.* The King's College party consisted of nearly forty people, including three school staff and "boffins" from Cambridge. The party was spread over a Base Camp and the five mountain camps† reconnoitred by Cambridge University Rover Scouts in 1952. For maximum efficiency and safety everyone's movements for each day were planned in detail. A further safeguard was provided by a signal network of radio, field telephones and lights, which covered all the camps.

The weather was fairly kind during August and plane tabling was possible at some time during most days but lake sounding was often severely hindered by high winds. Weather observations of course went

* Most of the surveying and meteorological instruments were obtained from the Air Ministry Meteorological Office and Cambridge University Geography Department, and "scientific" expenses such as insurance of instruments were covered by a grant from the Philip Lake Fund.

† See sketch map. Base Camp was by Glenmore Lodge, except in August, when it was transferred to Loch an Eilein.

on whatever the conditions—in fact we almost took a delight in watching to see just how bad the weather might get.⁴

3. *Writing up.* To many people, any mountain expedition for boys seems justified if it provides exciting and challenging conditions and opportunity for them to show the best sides of their characters. But, true and admirable as these benefits may be, other people feel that these alone are not enough, and that we should add the thrill of doing

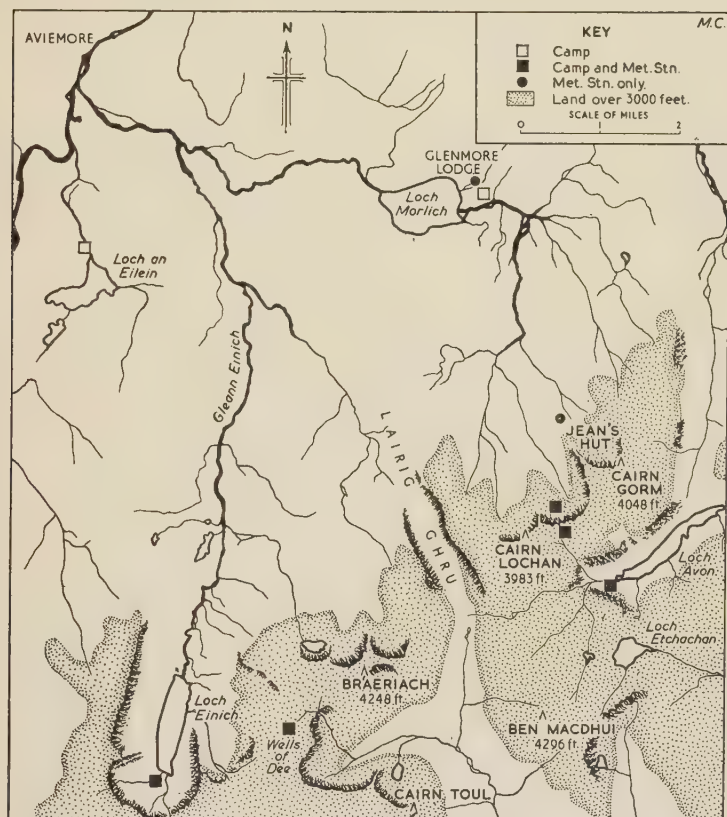


Fig. 1.—The Weather Survey camps and weather stations. (Crown Copyright reserved.)

an original piece of research. That thrill is obtained not only by making the observations in the field, but also by converting these observations into presentable records after the expedition is over. Wherever possible this was left to the boys, as it helped them to realize that their work could be of value to the experts. The initial graphing of the 35,000 weather observations, collected during the summer, was largely the work of boys from Perse School, who took the readings for the last two weeks, and the lake maps and photographic records were prepared at King's College.

The boys are now beginning to see some of the first fruits of their labours. The initial weather report, containing all the weather

observations, was produced under a grant from the Nature Conservancy, and, in February 1955, the first published analysis of it appeared in *Weather*.

The original material produced in one summer in the Cairngorms was enough to keep many experts busy for a long time, and it showed that there is much more work of a similar kind waiting to be done. This work is not difficult and, after proper training, is well within the scope of Sixth form boys and girls. It can provide a really useful contribution to geographical knowledge and, like the work at Glenmore Lodge, it can bring classroom geography to life in the best possible way.

[In order to popularize the idea of these scientific expeditions a film and a booklet have been produced. "The Way to Adventure" is a 16 mm. sound film, professionally finished, describing the organization and carrying out of the King's College expedition, and is obtainable at 10s. a showing from the Scout Film Library, 25, Buckingham Palace Road, London, S.W.1. The booklet is *Let's Run an Expedition*—1s. 3d. post free from M. W. Dybeck, Brathay Hall, Ambleside.]

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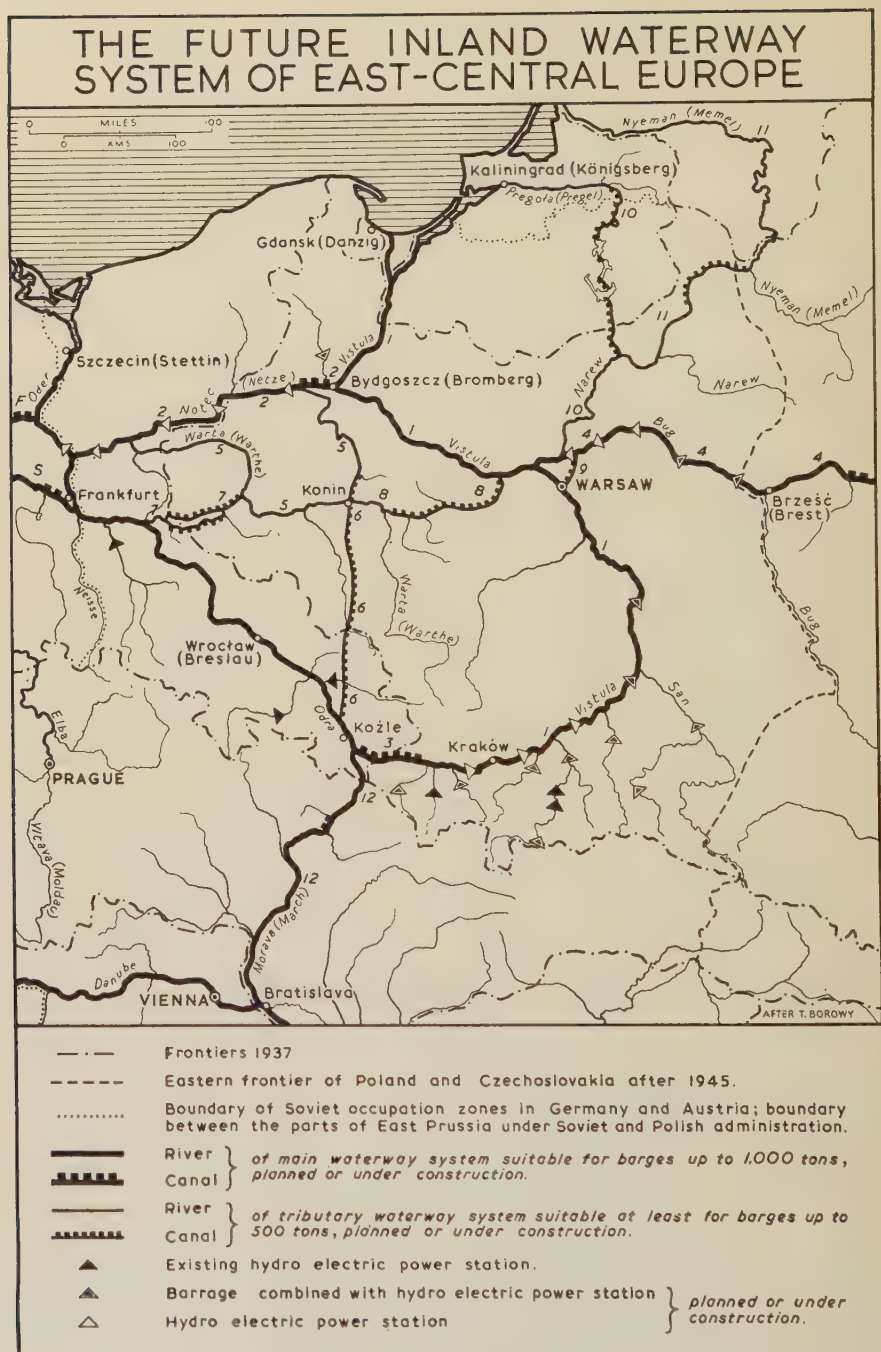
This Changing World

EDITED BY L. S. SUGGATE

INLAND WATERWAY PROJECTS IN EAST CENTRAL EUROPE

An important item in the Polish six-year plan for industrial expansion is the creation of an integrated waterway system, which is designed on the one hand to link the centres of mining and heavy industries within the present boundaries of Poland, and on the other to establish major waterway connections with Russia, Czechoslovakia and the Danube states, as well as with the German system of waterways by means of the Oder-Spree and Finow Canals (Map, S, F). The most important project is the establishment of a major ringway (Map, 1-3) with a length of 1,670 km., suitable throughout for 1,000-ton barges. The magnitude of this waterway, of which only disjointed sections are at present navigable for barges up to 400 tons, makes its anticipated completion by the end of 1955 seem over-optimistic. A major problem, and vital to all other projects, is presented by Poland's main river, the Vistula itself (Map, 1), which is at present navigable for larger vessels for only about 200 km. upstream from its mouth. To make it navigable for 1,000-ton barges throughout its total length of 1,100 km. not only necessitates considerable improvement of the river channel but also flood control and an increased flow at low water. Both objectives are to be achieved by the erection of a number of barrages on the upper Vistula itself, and on its Carpathian tributaries; some existing storages are to have their capacity increased. All are also to have hydro-electric power stations, a source of energy up till now largely neglected. According to Polish estimates the Vistula alone represents a hydro-electric power potential of 1,000 million kWh per year, out of a total for the whole country within her present boundaries estimated at over ten times that amount. This is about half that of Switzerland and a quarter that of Austria. Plans so far drawn up for the erection of hydro-electric plants anticipate an installed capacity of 500,000 kW and an annual production of 2,000 to 4,000 million kWh. A key position amongst the barrages as regards navigation will be held by the one on the Vistula below the confluence of the San; the reservoir to be built here will be capable of storing 3 to 4 million cu. m. of the San flood water, and thus will facilitate the maintenance of the low water flow of the Vistula at three times its present amount.

The northern section of the major ringway where works are already under way (Map, 2) is to be formed by enlarging the Bromberg Canal to the necessary size and reducing its locks from 23 to 9, and by appropriate canalization of the Netze river, on which it is also hoped to develop 100 million kWh annually. Integrated in the canalization programme are plans for extensive land drainage by the Netze, Vistula, Narev and Bug rivers. The southern link between the Vistula and Oder is to be secured by constructing a canal leaving the Oder near Kosel (Koźle) (Map, 3). This major ringway is to be connected with the Russian waterways by



canalization of the Bug and its tributary the Muchawiec (Map, 4), thus linking via the Pripyet with the already existing Dnieper-Bug Canal. After completion it will be possible to move 1,000-ton barges from the Black Sea

to the Baltic and North Seas. It is estimated that by means of the five barrages planned on the Bug 350 to 400 million kWh of electric current will be generated annually and 50,000 hectares of agricultural land irrigated.

This ringway is to be supplemented by a minor ringway to be constructed on the basis of the lower and middle Warthe river, with a new connecting canal from the Warthe at Konin to the upper Netze (Map, 5). This is to be linked with the coal-mining region of Upper Silesia by the "Coal Canal" (Map, 6). A new canal link between the Oder and Warthe by lengthening the Obra Canal (Map, 7) was due for completion in 1953, and is to be extended to the middle Vistula by what is known as the Warthe-Ner-Bzura Canal (Map, 8). Large harbours, suitable for 1,000-ton craft, are to be constructed in the two industrial suburbs of Warsaw-Zerań and Warsaw-Zegrze whence a short canal to the Bug is to be constructed (Map, 9).

A further waterway project (Map, 10), of particular interest to Soviet Russia, is the link from the Bug, and thus indirectly the Dnieper, to Königsberg in the Russian administered part of former East Prussia. This link will reduce considerably the distance and transport costs in comparison with the existing Narev-Nieman waterway (Map, 11), and involves a canal across Masuria. Completion of this Narev-Pregel Canal was scheduled for the end of 1954.

Yet another project is the construction of the Oder-Danube Canal from Kosel to Bratislava (Map, 12), on which work is to be started this year. This canal, also designed to accommodate 1,000-ton barges, will in particular provide an important link between the Danubian countries and east Central Europe. The plans now approved for it were designed by the Soviet engineer responsible for the Volga-Don Canal, but the construction is to be carried out by Polish and Czechoslovak authorities. This involves canalization of the upper Oder, not yet navigable, and the building of a canal link to the Betschwa, a tributary of the March, as well as the canalization of the appropriate sections of these two rivers. A major problem is how to overcome a difference in altitude of 350 m. in the crossing of the Moravian Gate; other questions such as securing the necessary water supply and the possible effects on the ground water-table need still further investigation.

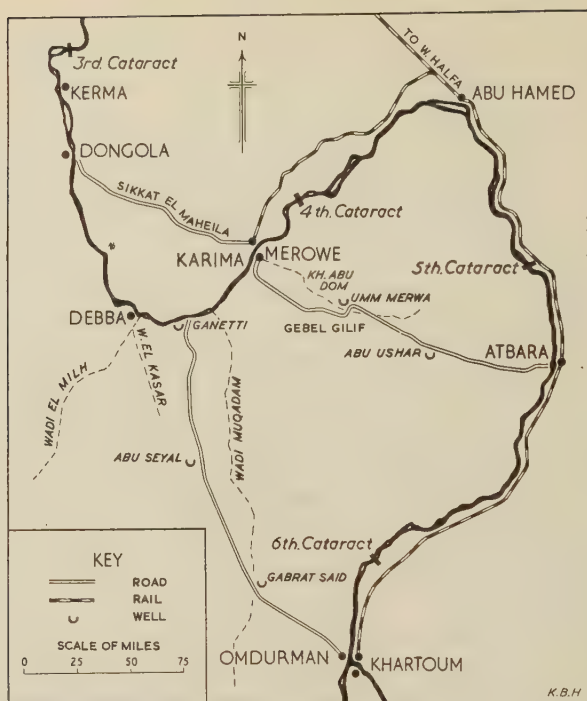
Even if not all the plans mentioned above materialize, it may be expected that the results will be impressive. These plans are therefore worth the geographer's attention not only for their own sake in their dependence on the physical conditions and as new landscape features, but perhaps even more for the indirect results which can be expected from this creation of a new mesh of localizing forces on the industrial development. (Based on H. S. Zeiler, "Die Umgestaltung des Wasserstrassen-Netzes in Polen und den deutschen Ostgebieten," in *Informationen*, Institut für Raumforschung, Bonn, 1953, pp. 543-50.)

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K. A. SINNHUBER

DESERT MOTOR ROUTES IN NORTHERN SUDAN

The sinuous course of the middle Nile, and its cataracts, have always limited its use as a waterway, except locally. Since the completion of the



railway system in the early years of this century, traffic to and from Egypt has used the railway between Khartoum and Wadi Halfa. The Nile waterway is thus used for through traffic only on the reach between the 1st and 2nd Cataracts. The railway, however, leaves the river at Abu Hamed and crosses the Nubian Desert to Wadi Halfa, and a branch line to Karima provides a connection with river steamers which sail regularly to Dongola (in low water season) and beyond, to Kerma (at high water).

This rail-steamer service has attracted considerable traffic. Outgoing freight consists mainly of dates—the chief cash crop of the riverine farmer—readily sold in the markets of the central Sudan. Incoming freight includes sugar, petroleum products (needed for the diesel pumps now largely replacing the *saqiya*) and the range of imported goods such as soap, cloth, cooking utensils, lamps and ready-made clothing stocked by retail traders, who buy in turn from wholesalers in Omdurman or Port Sudan. There is also a large passenger traffic, because the narrow ribbon of land watered from the Nile is incapable of extension, and many men seek employment elsewhere as labourers, domestic servants or government officials, and travel annually to their village homes during leave.

The rail-steamer service between Khartoum and the Northern Province is circuitous and slow. The journey between Kerma and Khartoum lasts about a week, mainly because the river steamer stops at many landing stages and does not move at night. Goods are apt to be delayed longer. Since the motor lorry proved its usefulness for desert transport, shorter routes have been developed between the terminals, as well as between intermediate points. Three such routes are now being used regularly, except during the sporadic rains of summer.

The first and most important connects the active markets of Omdurman and Debba. Before the coming of the railway, there was regular caravan traffic along this route, which was divided into stages by the important wells of Gabrat Saïd in the Wadi Muqaddam, and of Abu Seyal at the head of a left-bank tributary of this main *wadi*. Northwards of Abu Seyal, forage, and additional though less reliable water supplies were obtainable in the Wadi El Kasar. This journey normally took ten days, and the route could be frequented because of the forage, fuel and water obtainable in the *wadis* which were either crossed or followed, and which rise far enough to the south to receive regular though small summer rains. Since 1948 lorries have made regular use of this route, and the writer, on a recent northward journey lasting about 26 hours, passed no fewer than 14 southbound vehicles laden with passengers and sacks of dates. The present route does not exactly coincide with the old caravan route north of Gabrat Saïd, but follows a more easterly course between the Wadi Muqaddam and the Wadi El Kasar, over an open, wind-swept plain. The silt of the Wadi El Kasar and the flanking dunes are too soft for vehicles. The route now reaches the Nile at Ganetti, east of Debba.

A second route connects Ed Damer (5 miles south of Atbara), headquarters of the Northern Province, with Merowe, a District headquarters on the opposite side of the river to Karima. This route serves administrative rather than commercial needs. Officials can drive their cars or lorries to Merowe in about 7 hours, as an alternative to the much longer journey via Abu Hamed, part of which must be undertaken by train, by car and passenger alike. This route was pioneered in 1948 after a regular pontoon ferry began to operate at Atbara for the use primarily of the new cement works and does not follow an older caravan route. From Atbara Ferry, the cairned track strikes westwards across a gravel and earth plain to the wells at Abu Ushar; the next stage avoids the rocky, dissected Gebel Gilif and ends at the wells of Umm Merwa, near the head of the Khor Abu Dom. From this point this Khor would offer the most direct route to Merowe but for its soft silts, so the route curves away south-westwards before turning west and north-westwards to Merowe, crossing only a few small khors by means of simple causeways constructed of slabs of stone set in the silt.

The third route is known as the Sikka El Maheila and connects Karima with Dongola across the desert north of the Nile bend. Lorries leave Karima after the arrival of trains, reach Dongola in less than 24 hours and save several days on the river steamer. This route, equally with the first, competes with the rail-steamer service, and the railway administration has been compelled to take measures to prevent further losses of traffic. Express steamers will shortly appear on the river and will call only at principal landing stages between the terminals, reducing the total duration of the voyage to about two days.

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J. H. G. LEBON

OIL DEVELOPMENTS IN SOUTHERN AFRICA

Until 1954 all liquid fuel consumed in the Union of South Africa was imported. In 1954 and 1955, however, two developments have taken place

which reduce the Union's need for refined imports by about two-fifths. In January 1954 an oil refinery, operated by the U.S. Standard-Vacuum company, was opened at Durban. It is a medium-sized refinery, handling 200 million gallons (about 800,000 tons) of crude oil per annum, and its output includes 80 million gallons of petrol and large quantities of diesel oil and paraffin. Crude oil comes from Saudi Arabia, and refined products are distributed by rail in the eastern Union and by tanker to other Union ports and as far up the coast as Mombasa. Full development of the new Anglo-Iranian refinery at Aden may reduce this international function quite shortly. The Durban refinery has a catalytic cracking plant, and is soon to have by-product plant. It is located two miles from Durban Bay, frontage on which is almost fully occupied, and oil is piped from the wharf.

Inland, the SASOL oil-from-coal plant at Sasolburg in the Orange Free State about 25 miles SSW. of Vereeniging, has reached the production stage. This is a particularly interesting development in view of South Africa's wealth in good coal but total absence of oil resources. The plant will mine coal on the site and has an estimated reserve of 700 million tons of shallow-depth, low-grade bituminous coal. Using an American modification of the Fischer-Tropsch process, it is estimated that the plant will produce 70-76 million gallons of petrol a year, and also fuels and by-products. Sasol is larger and more costly than the Durban refinery, and its value depends on the protected inland location of the nearby Southern Transvaal market—with half the white population of the Union—which it will serve. Sasol is a deliberate, if autarkic, attempt to overcome an unbalance of resources: similar possibilities suggest themselves in inland Rhodesia where the large reserve of low-grade coal proved in two thick seams in the Zambesi valley of Northern Rhodesia in 1953 may be used in the same way.

Meanwhile oil prospecting in the continent-margin beds of Moçambique (analogous in age and origin to those of Exmouth Gulf, Australia) enters its seventh year. A fringe of continent-margin sedimentaries extends right up the east coast from mid-Zululand to Somaliland, and in addition to that in Moçambique exploratory work is in progress in Tanganyika, Zanzibar, and Kenya. Within the Union exploration is at present confined to the Karroo basin in the Orange Free State and near Dannhauser in northern Natal, where it is hoped to locate small pools of oil distilled naturally from coal (see map on next page).

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H. C. BROOKFIELD

MORE POWER FOR SOUTHERN AFRICA

At present almost all electricity generated for public sale in southern Africa is coal-thermal, except only a few hydro-electric plants and the very small diesel-generated supply of Nyasaland. The Union of South Africa has a capacity of 1,684 MW (2.62 million h.p.) which will rise to 3,679 MW (3.98 million h.p.) by 1958. Electricity is taking an increasing share of the Union's rising coal production (30.9 million tons in 1953, of which 25.3 per cent. went for electricity), and there is some fear that the railways will

be unable to handle the growing traffic: serious difficulties in coal distribution have occurred in each winter from 1950 to 1955. In the Union, coal is the rich resource, not water; it is quite otherwise in Central Africa. Here there is coal in quantity, but little is developed, and labour shortages inhibit large-scale working. On the other hand there is abundant water power available in the Zambezi and its major north-bank tributaries.

In the Federation of Rhodesia and Nyasaland the present installed capacity is only 457 MW (620,000 h.p.) and works in hand will raise this to only 715 MW (960,000 h.p.) in 1957. All coal is supplied from the single group of mines at Wankie, and must be transported over a single-track railway. Drastic action to curb strikes on the mines and railways in 1954 highlighted the country's precarious dependence on this resource. The problem area is the Copperbelt, supplied by power stations at each of the



present four mines, interconnected by a grid. Here the shift system creates a continuous demand, and net output is almost as great as the whole net output of Southern Rhodesia (784,810 MWh against 878,848 MWh in 1953). Coal deliveries to the Copperbelt have been inadequate since 1946 and over half the current requirements of its power stations are met from wood and waste-heat steam. Fortunately, the Copperbelt is in a forested area; cutting is now at a rate of 5,000 acres per annum. In 1957, Wankie's coal production will reach 5 million tons, of which 60 per cent. will be needed for electricity. Power limitations threaten the whole Federation, but especially the Copperbelt, where installed capacity will show a shortfall from 1957 on. Since copper revenues provide over half the Federal revenue, this is a major problem to the whole country.

Hydro-electricity provides the solution. As a temporary measure the copper companies have made arrangements to buy, from 1957 to 1962, 50 MW annually from the Belgian mining company in the Congo where

power from the upper Lualaba at Koni, N'Zilo and Delcommune (400 MW by 1957) will temporarily exceed demand. By 1962 it is hoped that the Federation will have its own hydro-electric supply. Two schemes have been under discussion for some years. The first, on the Kafue, envisages a dam at the head of a gorge in which the Kafue descends 1,950 feet in 22 miles. Initially, 400 MW of firm power could be developed, and the ultimate capacity, with further regulation upstream at the Meshi-Teshi gap, might reach 800 or 1,000 MW. The second scheme, at Kariba gorge on the Zambezi, is larger and more expensive, but yields greater returns at the first stage. 1,000 MW could be generated from a dam in the gorge, which has no gradient; the river would flood back for a considerable distance.

A decision between the two schemes has been difficult, and made more so by inter-territorial friction. The Kafue scheme had been energetically pressed by Northern Rhodesia since 1952; in 1954, the Federal government proposed to proceed with it but there was strong opposition in Southern Rhodesia. An expert French opinion on the two schemes was secured, together with revised estimates of future demand, and the Federal government in 1955 changed its decision in favour of Kariba. An application to the World Bank for a loan of over £50 million, to finance Kariba, has been favourably received and preliminary work has commenced.

Kariba is 200 miles further from the Copperbelt than Kafue. The decision therefore rests on the larger proven capacity and lower cost (0.254d. per unit against 0.332d. for Kafue), in relation to estimated future needs. In the Copperbelt consumption estimates for 1964 and 1970 are respectively 315 MW and over 350 MW. For Southern Rhodesia, with rapidly expanding industry, estimates for 1961 and 1970 are 442 MW and 1,385 MW. These represent only a 9 per cent. per annum increase, which is not abnormal at the present time. Kariba should be completed before the end of 1961. Even so, difficulty will arise before then, and Kariba alone cannot satisfy rising demand if the expected rate of expansion is maintained beyond 1970. Further capital investment may well turn on the viability of the Federation. There is, however, no shortage of potential power, which is available on the Zambesi itself, on the Kafue and other tributaries and on the Shire in Nyasaland. Central Africa has little good soil, but large reserves of coal and metallic minerals while its rivers carry potential power. The Kariba scheme would seem to be a first step in a major industrial revolution in Central Africa.

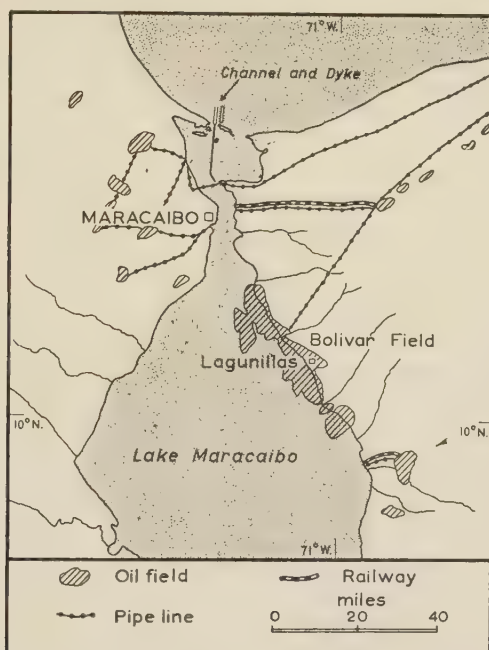
University of New England, Australia
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H. C. BROOKFIELD

LAKE MARACAIBO, VENEZUELA'S WESTERN EXIT

In this century the increased importance of the Bolivar oilfield has led to the Maracaibo basin becoming the most productive region, and Maracaibo the second city, of Venezuela. The great handicap, however, has been the limitation imposed upon the maritime commerce of the lake-shore settlements by an extensive shallow sand-bar, 20 miles wide, which prevents easy access to Lake Maracaibo from the Caribbean.

Various improvements from time to time have enabled ships of 13 feet draught to enter, but this depth still debarred the larger tankers and caused considerable delays in the transshipment of other products. In March 1953, a final effort was begun to breach the sand-bar with an inner channel 600 feet wide and an outer one 1,000 feet wide, both having a minimum



depth of 35 feet. The inner channel, 14 miles in length, was opened in December 1954, and the outer section, 7 miles long, with a protective dyke parallel with it to the east, will be finished by the end of 1955. The rock dyke, 1,000 feet wide at its base, 24 feet wide at the top, and projecting 10 feet above sea level, is needed to prevent the outer channel being filled with sand by the currents swept westwards by the Trades.

The cost of the work, approximately £13 million, has been met in part by loans from the four principal oil companies operating in Venezuela, and it is estimated that tolls from ships using the channel will pay for the cost of construction within 18 years.

University of Birmingham

GILBERT J. BUTLAND

Obituary

PROFESSOR WILFRED SMITH

The sudden death of Wilfred Smith on 27th September 1955 came as a great shock. A Yorkshireman by origin, he entered the University of Liverpool as Bibby Scholar in 1921, and took his B.A. Degree in 1924 and his M.A. in 1926. He was appointed Tutor in the Department of Geography in 1924 and Assistant Lecturer in 1928; and then he became successively Lecturer, Senior Lecturer and, finally, Professor in 1950. He was appointed Dean of the Faculty of Arts in 1953, and died while in office. His entire academic life was therefore bound up with the University of Liverpool to which he had a deep and abiding loyalty.

His first book, published as early as 1926, dealt with *Coal and Iron in China*, an appropriate subject in the department of Professor Roxby. From this beginning his work developed to assume a double character. On the one hand was his interest in Lancashire and Merseyside. Monographs published in 1941, 1942 and 1946 culminated in 1953 when he edited, and contributed to, the notable *Scientific Survey of Merseyside*, published on the occasion of the visit of the British Association to Liverpool. His second interest developed upon a larger canvas, and *An Economic Geography of Great Britain* first appeared in 1949. It showed us a man equally at home on both the agricultural and the industrial sides of economic geography, and, too, with a full appreciation of the historical element in our present-day surroundings. It can well be described by the words "massive" and "monumental". It was based upon a most exhaustive examination of the available data; it was not only an authoritative statement of basic facts but it set a new standard of achievement in the treatment of economic geography. Since the appearance of this book, his interest had been largely concerned with the location of industry, and we were in the middle of learning from him when he died.

He was not only a scholar but a teacher and an administrator. As one of his former students has written: "How intriguing the economics of baking and of crop husbandry became" when taught by Professor Smith; and he taught so well because he was a friend as well as a teacher. He made it his business to know every student personally in his Department. Outside the Department, he delighted in University business, and had a flair for grappling with the complexities of University regulations. He brought to these matters the same methodical and penetrating insight that he brought to problems of scholarship, and it was always a pleasure to hear him elucidate some nice point of procedure. He made a good Chairman, and in ordinary day-to-day business he was shrewd, courteous and fair-minded. He served his University well.

His ability and sympathy were also sought outside the University. He was President of the large and active Merseyside Branch of the Geographical Association. In the words of the Chairman of the Branch, he was "always ready with wise counsel, warm encouragement, and active and generous help". He not only wrote about the geography of Merseyside, but did much

to foster an understanding of it among those who live there. Again balancing his Merseyside friendships there was a wide circle outside, and he had become the President of the Institute of British Geographers in 1954.

Such is the bare record of his academic life, and he died in the full vigour of his achievement. Those who knew him well, and who were fortunate to work closely with him, were always conscious that here was a man of integrity. He had very high standards in personal as well as in academic matters, and yet his views were always tempered with kindness. He gained affection as well as respect. We shall not easily meet his like again. To Mrs. Smith, his friends and colleagues wish to extend their warm sympathy.

H. C. DARBY.

MISS EDITH MARJORIE WARD

Older members of the Liverpool Branch will regret the death of Miss Edith Marjorie Ward, which occurred at her home, Crag Foot, Grasmere, in the Spring of this year.

Miss Ward was born at Leigh, Kent, and after spending part of her childhood with her family in Odessa, removed with them to West Kirby and became a student at Liverpool University. She graduated B.Sc. in 1908, was granted a Special Certificate in Geography in 1910, and was awarded the degree of M.A. (Geography) in 1915. In 1910 she became Tutor in Geography, with Mr. P. M. Roxby as lecturer, being thus one of the first women in this country to hold a university appointment as a geographer. Her first study, "The Agricultural Geography of Yorkshire," was published in volumes vii and viii of *The Geographical Teacher*. Retiring into private life early in the first world war, she later published two books still of considerable interest to geographers: *English Coastal Evolution* and *Days in Lakeland*, the latter a mine of curious but significant fact. Later there followed a number of slight but pleasantly written novels, each with an obvious geographical background; *Deborah in Lakeland*, *Far Easedale*, *Dancing Ghyll* and some half-dozen others, of which *Sea Wind*, which is set in the sand-dune belt of southwest Lancashire, is unique, it is believed, in having as a character the only geomorphologist in fiction.

J. E. ALLISON.

Geography Teaching

Some Autumn Events

The Michaelmas Term is a kind of educational New Year and has this year brought a number of events of interest to geography teachers up and down the country. In October the Institute of Education of the University of London assembled an exhibition of geographical material selected from a great variety of schools within the area it serves (roughly south-eastern England). This exhibition, open daily in the University for four days, was a source of encouragement and stimulus to the many teachers, students and pupils who were able to visit it; much of its significance lay in the fact that the work shown was really typical of the everyday teaching in the schools and in no way specially prepared. It possessed, therefore, a reality and individuality more suggestive, perhaps, than any written thesis on educational theory or practice.

The exhibition was divided into Primary and Secondary School Work (the work in each case being grouped under four main headings—"Geography Looks Around," "Geography Looks Outwards," "Geography Looks Abroad," "Geography Takes a World View") and included work carried out at both levels in conjunction with the British Ship Adoption Society, with the Imperial Institute, with the Council for the Promotion of Field Studies, and with the Association of Agriculture. In the Primary Schools section, there were several exhibits on observing weather, mostly graphically and colourfully, and often very ingeniously, illustrated. Willingdon County Primary School exhibited alongside the children's weather diaries photographs of its weather station, including an ingenious anemometer built from cistern balls (cut in half), a pram-wheel hub, cycle free-wheel, and a length of gas pipe.

The range of children's skills called upon in carrying out work of this kind at 9 years and more is extensive—art, arithmetic, English, handwriting, nature study and observation are all used to produce geographical work. Most of the exhibits bespoke a lively curiosity aroused in exploring the local area, an ability to describe and to illustrate—and the children's absorption in each other in a world apart from any geographical aim. Children of 8 to 11 years produce lengthy individual notebooks written, illustrated and bound with the interest and loving care given to undergraduate theses. The majority of the teachers responsible for this primary school work are not specialists in geography and are to be congratulated on their original approach to the subject. A project for 9 years particularly worthy of mention was based on imaginary journeys to lighthouses; this led to studies in railway communications and shipping, of the physical characteristics of the coast and, using the child's keen interest in people, of the lighthouse-keeper's life and daily work. Another, for children of 10 to 11 years, combined history and geography through biographies and exploration and culminated in individual written biographical studies, an exploration "frieze" and maps.

The variety of work in the Secondary Schools section was as diverse as the variety of teachers' personalities, abilities and interests. Originality introduced into some well-known methods of map- and diagram-making and the prolific resources for local study available in the landscape of the south-east have yielded finished material that is obviously alive and thought-provoking in the minds of the pupils. In a sample study by a third form of a district outside the area, to illustrate the geography and relationships of typical scarp country (using the one-inch Luton examination extract), maps had been dissected, features abstracted and information sought individually to produce a diagrammatic transect worthy of comparison with the fruits of a real field traverse. There were many examples of weather recording, one noteworthy instance being the sunshine recorder designed and made in the school workshop at Dagenham Marley County Secondary Boys' School from a boiling flask of four inches diameter and filled with carbon tetrachloride, which gives the same focal length as a standard instrument; standard recording cards were used.

An outstanding example of field work was exhibited by Ilford County High School for Boys, who graduate year by year through carefully planned stages of field work described as

- (i) doorstep work—immediate locality, weather records, map work;
- (ii) expansion work—fifth form, in southwest Essex, developing from physical studies to land use, siting of industry, settlement patterns;
- (iii) further widening—day excursions in southeast England—with the Weald profitably accessible;
- (iv) looking outward—annual excursions to areas of marked contrast, e.g. Bristol, North Devon, Lake District.

This school has now taken part in joint school sixth-form field work with five other schools (including girls' schools) and has undertaken field work on the continent. The teacher systematically illustrated the work involved in planning and carrying out field excursions in stages:

- planning stage*—teacher's preparation of introductory notes;
- preparatory stage*—issue of instructions, notes, diagrams, maps, etc.;
- executive stage*—in the field, (i) gathering impressions (walking excursions, industrial visits), (ii) gathering samples (geological specimens, industrial materials), (iii) gathering data;
- report stage*—the individual writing up and map finishing;
- reflective stage*—exhibition and discussions.

A valuable and logical development of field-work practice was here illustrated, introducing younger children to outdoor work locally and, little by little, widening the field of activity, at the same time deepening the studies.

Also during October there was a joint meeting between two sections of the Geographical Association—Training Colleges and Secondary Schools—in order to discuss problems of teaching geography in secondary modern schools. Mrs. D. R. Martin, of Copnor Modern Girls' School, Portsmouth, hot foot, it seemed, from the classroom, gave a lively start to the discussion in a series of practical suggestions for the training of student teachers; she would like to see the introduction of films and filmstrips to

illustrate teaching techniques; she felt that students have too little knowledge of B and C stream children, being themselves but recent products of the A stream and A stream teaching methods, normally in grammar schools; and she deplored the common lack of resource in young teachers by which they find it difficult to take over classes at short notice and to use such time profitably. Turning from these matters of general education, she recommended very strongly, from her own experience, group work of as great a diversity as possible, for fourth-year pupils whose interest in school work tends to fall off; this, she said, gives them satisfying and rewarding work to do. The second speaker was Mr. P. R. Heaton, headmaster of Belmont County Boys' School, who felt that there exists a misconception about potential modern school standards; there is a need in the first year to establish the self-respect of some children who may feel that they are "failures," and the geography teacher should help in this by setting high his own standards of work, introducing, for instance, practical land survey as a kind of psychological boost. Especially he regretted that many teachers in modern schools do not seek to diversify their methods by practical work; some, he felt, are unwilling to introduce mapwork and physical geography, both of which could be adapted even for lower streams. Mr. E. B. Dobson (Winchester Training College) found that many students training to teach in modern schools had had little or no previous practice in field work during their own education and would naturally shy away from the acknowledged difficulties of undertaking both practical and outdoor work. In fairness, it must be added that Mr. Heaton revealed that in his own school he has an A stream equivalent to a good grammar school stream.

He further commented that the teacher of geography should always prepare his lessons, even after long experience, and should seek to extend his factual knowledge of local geography the better to develop local studies in his school. He suggested that young teachers tend to retain, possibly unconsciously, the grammar school methods by which they were themselves taught, thereby rejecting the training in theory and teaching method and the special demonstration lessons given by their college lecturers. Some lecturers disagreed with this suggestion, in the belief that the students have been unaware of "method" when they were themselves pupils. Others regretted the unhelpful attitude of those teachers of longer standing who recommend hard experience to the newly fledged teacher rather than the "high-falutin' stuff" they have learned at college.

In a succinct survey of a training college lecturer's work, Miss M. G. Goss, of Stockwell Training College, Bromley, showed that in the training of modern school teachers there lies a general educational problem—whether "specialists" or "general teachers" are wanted. The lecturer who is himself a geography specialist is concerned with instructing groups of students in teaching method applicable to all grades of school from nursery to grammar school; a very small percentage of students takes geography as a special subject and the opportunity for extensive content work is limited; the majority are therefore general teachers for whatever educational stage they have elected to enter. The small number of specialists spend, on an average, a third of their time on practical and field work.

Behind the wide variety of problems put forward in discussion, two major sources of difficulty could be discerned—the question of selection

of teaching material, and the formation of a satisfactory syllabus. These problems can hardly be said to be restricted to modern schools, and they might fruitfully form the basis of future discussions. To resolve the specific difficulties that rise from them will, however, undoubtedly remain the task of the individual teacher if he is able and conscientious. Selection of material must depend alike on the interests and ability of the teacher and the needs of his particular school. Mr. B. S. Roberson, Institute of Education, London, recommended that subject matter should be left out ruthlessly where it is difficult to incorporate in a scheme of work, whether because of the children's or the teacher's inability easily to include it. Study in depth of topics limited in scope was generally accepted as more satisfactory than superficial all-embracing world geography. The former should provide the desirable basis for the recognition of geographical relationships, for the development of more critical reasoning powers and logical interpretation when fifteen-year-olds leave school.

Mr. Heaton, protesting against the frequent use of textbooks as the basis of syllabuses, described the ideal syllabus as satisfying in combination the needs of the children, the teacher and the environment of the school, using the resources of all three. While individual and local problems of preparing syllabuses were recognized, most people agreed that the provision of ready-made syllabuses would be quite unsound.* Suggestions for the development of a syllabus might be offered to teachers in difficulty, but it was felt that this is best done, as it is generally done already, privately between lecturers and teachers in some areas, or by discussion amongst local groups of geography teachers with common interests and environment resources. Geographical Association branches, it was suggested, might consider initiating discussions on the subject for the benefit of local teachers.

It is interesting in the light of these discussions to read in a volume of *Geography* of some thirty years ago in a vigorously written article by Ernest Young ". . . there are no ready-made schemes. Each district, perhaps each school, needs its own scheme and the wonderfully complete arrangements offered by various publishers are a delusion and a snare. They are meant only for the lazy and the ignorant and there is no room for these characteristics in the make-up of the modern teacher." The British teacher thinks independently now as then, and is apparently beset by the same problems—insufficient time and the restricting pressure of the rest of the curriculum and the examination syllabus. It is enlightening to read the suggestions for improving geography teaching methods in these older issues of *Geography*; Ernest Young, for instance, was already advancing (though using different terms) the sample study method and outdoor observational study and good teachers were already using methods which remain as profitable and applicable now as then, in secondary schools, grammar or modern. It is well that young teachers should be encouraged, as indeed they are in most colleges, to turn back the pages of the journal, even beyond 1914, and to read these vital papers, written when these teaching methods were fresh discoveries; there is much to stimulate thought on their present-day application.

* A view noted here as an endorsement of the long-standing editorial policy of *Geography*.—Ed.

Finally, this autumn has brought practical help in some teaching problems in the form of two new reference books. *Handbook for Geography Teachers** is published to replace the book of the same title, edited in 1932 by Miss D. M. Forsaith of Goldsmiths' College. The basic pattern of the book remains the same; the treatment brings its subject-matter right up-to-date. A useful characteristic of the book is its provision of practical information, e.g. on sources of visual materials and projection apparatus, on the production of duplicated material, or on how to set up a weather station with a reference list of relevant publications of the Meteorological Office. Separate chapters consider the principles of teaching geography in primary and secondary schools and in each suggestions for syllabuses are provided; in the case of secondary schools, modern, technical and grammar schools are treated individually. Well over half of the *Handbook* consists of classified book lists, of textbooks, library books, reference books, etc., with appraisals by practising teachers to assist the reader in his selection. These lists are extended to include books on the teaching of the subject and on "Geography in Literature"; the latter will appeal to many teachers. There is no index, but a full list of contents is an excellent substitute.

A Geographer's Reference Book,† edited by C. H. Saxelby, was originally conceived as a yearbook chiefly to assist teachers to keep textbook material up-to-date. This enormous task proving impossible of achievement, desirable though that may be, the editor wisely decided to adapt the material which his contributors have provided to form a useful compilation of information and references not conveniently obtainable elsewhere. Examples of this are the chapters on geography in universities, including information on conditions of entrance to schools of geography, entrance scholarships in geography and a list of departmental staffs; on sources of geographical information and statistics; and on societies and institutions useful to the geographer—the latter a national list of great value to searchers for local references. The *Reference Book* also deals with the teaching of geography today, adopting a general approach to this and giving greater emphasis to local geography than the *Handbook*; on this subject it gives a bibliography of both method and subject sources. Students considering a career of teaching geography will find valuable a statement on the training of teachers and the availability of courses for practising teachers. Half of the book is given over to a survey of new developments in world resources, which deals systematically with recent trends in agriculture, fuel and energy development (including atomic energy), industry, transport and communications. This chapter provides a mass of up-to-date statistics (and a full list of references for the conscientious reader) and will be helpful in the assessment of changes in the patterns of industrial and economic geography; recently published economic atlases could profitably be consulted when it is read. It is regrettable that the lettering of one of the three maps illustrating this chapter is almost illegible through excessive reduction. There is a full index to the whole book.

* *Handbook for Geography Teachers*, ed. G. J. Cons for University of London Institute of Education. 12.5 × 19 cm. xxiii + 448 pp. London: Methuen. 12s. 6d.

† *A Geographer's Reference Book*, ed. C. H. Saxelby. 15.25 × 23 cm. 222 pp. Bolton: C. H. Saxelby. Distributed by the Geographical Association. 14s. 6d.

The Geographical Association

NEW CHAIR OF GEOGRAPHY

The Association welcomes the creation of a new chair of geography—the seventh—in the University of London and offers its cordial congratulations to Mr. A. E. Smailes, Head of the Department of Geography at Queen Mary College, on whom the title has been conferred.

NOMINATION OF NEW MEMBERS OF COUNCIL

Four new members of Council are due to be elected at the Annual General Meeting to be held on 5th January 1956, to replace retiring members. Nominations should be sent to the Honorary Secretary at headquarters immediately, signed by four members of the Association. The persons so nominated must have expressed their willingness to serve on Council from 1956 to 1958.

ANNUAL CONFERENCE

The Annual Conference will be held in the London School of Economics from 3rd to 6th January 1956. The programme has already been circulated to members. Others wishing to receive this should make immediate application to headquarters. Members desiring tickets for the twenty-fifth annual dinner, excursions, etc., should make application to the Conference Organizer for these at once if they have not already done so.

SPRING CONFERENCE 1956

The next Spring Conference will be held from 3rd to 7th April at Brighton. The programme will be included with the January issue of *Geography*. Early application for accommodation should be made to the Honorary Conference Organizer, Mr. A. H. Fry of Brighton Technical College, when the reservation forms are received.

SUMMER SCHOOL AT AIX-EN-PROVENCE, 1955

The Association places on record its warm thanks to Professor A. E. Smailes for his outstanding leadership of the Summer School at Aix, assisted by Dr. A. Garnett, Mr. Eric Brown and Mr. J. L. H. Sibbons. It is hoped to publish in due course a full account of the proceedings and of the work accomplished; but meanwhile, we may report that for the 72 members of the party, this was indeed a most valuable experience, giving insight into the varied geographical characteristics of Mediterranean lands; of the local regions of Provence, the Maritime Alps, the maquis and Garigue; the Crau and Camargue, and the immense delta of the Rhône. The diversity and contrasts within the area were studied under the heat of an August Mediterranean sun, which however did not wholly rule out opportunities for some local individual field work by members working in small groups. We are greatly indebted to the Recteur of Aix University and the Director of the Cité Universitaire for admirable residential facilities, and to numerous local experts who helped us in our studies at many places, thanks to the co-operation of the staff of the Department of Geography. So successful was the course in every respect that we hope to repeat this school at an early date; and those who attended it, no less than those who hope to join us next time, will enjoy hearing an account from the leader, illustrated by coloured slides and films, in the course of the Annual Conference on 4th January 1956.

LIBRARY CATALOGUE—ASIA SECTION

The first section of the new Library Catalogue is now in the press and will be available for circulation about the end of the year. This section of the catalogue (approx. 48 pp.) which covers the Library's collection of books on Asia, one of the

largest parts of the library, will cost to members of the Association, 2s. 6d. (post free); to non-members, 3s. 6d. (post free). Copies will be sent immediately on publication to members who have already informed headquarters that they wish to receive the catalogue instalments as they appear. It would assist headquarters in assessing the required size of the edition of this and ensuing parts if members who wish to receive the catalogue, and who have not already informed us, would now write to the Assistant Secretary about this matter. The previous announcement about the catalogue appeared in the April issue of the current volume of *Geography*.

PAYMENT OF SUBSCRIPTIONS UNDER COVENANT

We would remind members that a further response to the appeal to agree to covenant subscription payments for seven years would be of the greatest assistance to the Association. We are deeply grateful to those members who already have helped us in this way, and would urge others to apply to headquarters for further information about the scheme and for the appropriate form of Deed of Covenant to enable us to increase our claim for refund of income tax paid at the Standard Rate on the amount of such subscriptions.

DONATION FROM YORK AND DISTRICT BRANCH

We gratefully acknowledge a generous donation by the York and District Branch, which enables us to publish two of the lectures read at the Spring Conference at York in April 1955. These lectures are included on pp. 215-36 of this enlarged issue of *Geography*.

BRANCH NEWS

It has not yet been possible to organize a new branch at Watford, and inaugural meetings have been deferred.

Members in the Grimsby and Cleethorpes district will be interested to learn that attempts are being made to organize branch activities there. They are asked to get into touch with Mr. J. B. Horwell, 26 Danesfield Avenue, Waltham, Grimsby, informing him of their interest in participating in such activities.

As a result of an enquiry by the secretary of the Blackpool Branch, it has been decided to have line-blocks made in two sizes from the map projection design used on the new cover of *Geography*. These blocks will be available at headquarters for loan to secretaries of branches for use on Geographical Association branch stationery, notices and posters; they measure $1\frac{7}{8}$ in. and $3\frac{1}{2}$ in. across. The copyright of the design belongs to the Geographical Association.

CORRECTIONS

The following errors or misprints have occurred in this volume (xl) of *Geography*:

Part 1, January, p. 49, line 27: The gauge of the Gold Coast railway should have been described as being 3 feet 6 inches.

Part 2, April, p. 116: In Fig. 7, Freetown, general land use, "King Town" should read "King Tom" and refers to the peninsula immediately west of the old port and north of Whiteman's Bay (see Fig. 3).

Part 3, July, p. 197, line 27: For "\$2 million" read "\$200 million."

GEOGRAPHY AND POSTAGE STAMPS

Readers who are interested in philately (and teachers who use postage stamps in class projects) may wish to know of two recent examples of pictorial postage stamps whose designs illustrate diagrams in *Geography*, both in the current volume (xl), part 2, April. A current Sierra Leone issue, value 3d., shows the view from the harbour of Freetown, illustrated in the map of the site of the city (Fig. 3 of Dr. Jarrett's article,

p. 111). The second stamp—a 30-cent issued by Uganda, Kenya and Tanganyika—shows the completed dam at Owen Falls, Uganda, which is illustrated in Mr. McMaster's article by Plate II, facing p. 123 and the map on p. 125.

FORMATION OF AN ASSOCIATION OF COMMONWEALTH GEOGRAPHERS

It has been proposed by Dr. Kularatnam of the University of Ceylon that an Association of Commonwealth Geographers should be formed. The executive committee has agreed to help sponsor this new venture, and for the time being our headquarters will act as the office for the new Association. We hope that by this means the interests of Commonwealth Geographers will be better co-ordinated; that news of proposed or desired exchange visits will be publicized; and that geographical news, information and research regarding the regions within the Commonwealth will be published, possibly as a supplement to *Geography*. It is suggested that in the initial stages all full members of the Geographical Association will be entitled to become members of the Commonwealth Association on payment of a small supplementary subscription for which they may receive the Commonwealth supplement. We shall be glad if those of our members, and especially those resident in Commonwealth countries outside Britain, who are interested in becoming members of the new Association would communicate with the Assistant Secretary at Headquarters.

LANDSCAPE DRAWING

The Association is happy to be able to draw the attention of teacher members to a valuable aid to classwork in the field. This is a booklet *An Introduction to Geographical Landscape Drawing (Lowland Country)* which has been compiled and published by Mr. Geoffrey Hutchings, the Warden of the Juniper Hall Field Centre of the Council for the Promotions of Field Studies. Its sixteen pages present five annotated landscape drawings from Mr. Hutchings' own pen, together with five helpful diagrams and some eight pages of text in which the fruits of the author's skill and experience are very simply and effectively made available to all that large army of persons who wrongly believe that "they can't draw". Copies may be obtained from Mr. Hutchings, Juniper Hall Field Centre, Dorking, Surrey, price 1s. 2d. post free.

CERTIFICATE OF PROFICIENCY IN NATURAL HISTORY

Our attention has been drawn to a revision in the regulations for the Certificate of Proficiency in Natural History of the University of London Department of Extra-Mural Studies, which is designed to promote natural history studies in the field. Formerly restricted to teachers, the course and examination are now open also to persons other than teachers who are interested in the study of living things in their natural habitat. The work for the Certificate includes a directed course of private reading and attendance at a practical course (of a total of 4 weeks) at a suitable Field Centre during Spring and Summer. Full information about the syllabus and registration can be obtained from the Secretary, Natural History Course, Department of Extra-Mural Studies, University of London, Senate House, London W.C.1.

AIDS TO PREPARING AND STORING VISUAL MATERIAL

Mr. Alan Vincent, of the Westminster Branch, is compiling a catalogue of suggestions on this subject for teachers, which will first be issued in sections through the Visual Education National Information Service for Schools. The first section is due early in 1956, dealing with lettering, drawing and reproduction of charts, diagrams, maps, etc., printing and duplicating processes. Mr. Vincent would be glad to receive at 16 Hillmead Way, Sanderstead, Surrey, suggestions from teachers of items for inclusion in the compilation, such as sources of supply of materials useful in the making and handling of visual aids of all kinds.

Correspondence

SOLAR HEATING OF LAND AND SEA

May I, as a physicist, ask for a little space in your journal to draw attention to a minor error of omission in all the text-books on physical geography with which I am familiar?

The question at issue concerns the factors which affect the rate of rise of temperature of sea and land resulting from solar radiation. A complete solution of this problem would be very complex, but we can see at a glance a number of factors which are likely to be relevant: thermal conductivity, depth of penetration of radiation, reflexion factors, degree of turbulent or convective mixing etc. To these the text-books add 'specific heat', pointing out that this factor for water is roughly five times greater than it is for land.

Now in attempting an approximate qualitative discussion of the problem we consider the effect of each factor in turn *the remaining factors being assumed constant*, i.e. the same for land and sea. In particular, if thermal conductivity and depth of penetration are the same, and no mixing takes place in the sea (since none can take place in land) the solar radiation will heat equal volumes of land and sea. In this case the rate of rise of temperature is inversely proportional, not to specific heat alone, but to the product of specific heat and density (which is the thermal capacity per unit volume). Since the density of the earth's crust is about 2.7 times greater than that of the sea, the general comparison of 5:1 in favour of a relatively high rate of rise of temperature of land is reduced to about 2:1. By ignoring density but mentioning specific heat the text-books in effect imply that they are considering equal masses of land and sea instead of equal volumes: a most unsatisfactory approach since it implies confusing the issue by dragging in part of the contributions of penetration etc. along with the specific heat factor.

It may well be that the effect of the relative thermal capacities is so small as to be swamped by the other factors. This, however, cannot excuse the misleading reference to specific heat without any reference to density. My plea therefore is that no mention be made of this factor at all, or that density be always linked with specific heat in this context either explicitly, or implicitly by using the term thermal capacity per unit volume instead of specific heat.

Manchester Grammar School.

R. STONE.

THE ANATOLIAN AND THE INDIAN VILLAGE

Mr. Brice's study of the Anatolian village seems to me excellent so long as he stays in the Anatolian village. But I think that the logic of his wider excursions may be open to some question.

Of course "new techniques of farming, transport, and administration do not necessarily damage the fabric of established village life". If it were so, all technological advance in the countryside would be accompanied by social disintegration, and disintegration often (not always) spells retrogression. It is true that a great deal of human history is just that; it takes time for the new technological forces and the old social structures to adjust themselves symbiotically, and until a synthesis is reached much social deterioration may occur. We do not need to go to Anatolia or India for examples: the English villager in the age of enclosures, the Spitalfields handloom weaver, bear witness.

But if not necessarily damage, then necessarily change, in directions and degrees which in accordance with specific circumstances may be for good or evil. Mr. Brice's last two paragraphs suggest that in the disintegration of an established fabric I see only evil; but that depends on what the fabric was like. Change is not always

disruptive, and even disruptive change may be necessary change, and this was indeed the whole burden of my conclusion.

I seem to have upset Mr. Brice by quoting Marx. My argument was not inspired by his articles, but by seven years of direct observation and by a reasonably wide reading in the relevant literature, much of the best of it written by British officials. I quoted Marx for a simple but excellent reason: there are few writers more pungent or pointed than Marx at his best.

I do not wish to examine Mr. Brice's roseate view in detail; it is perhaps rather one-sided. He does not note, for example, the virtual destruction of whole sectors of the village artisanate, an integral part of the established fabric, by the import of cheap factory goods. Mr. Brice has one or two valid points; I have expounded them in greater detail elsewhere. One question however may be asked: "British administration naturally effected many changes in the life of the Indian village. Yet the experience of the Turkish village would suggest [not *may* suggest] that they were not as disruptive as is suggested by Professor Spate." In what sense can what the Turkish government did in Anatolia be evidence as to the effects of what the British Raj did in India?

The Australian National University, Canberra

O. H. K. SPATE

Professor Spate has read more into my last two paragraphs than I intended, for I was not concerned to discuss whether recent changes in the Indian village are to be welcomed or deplored. I wished only to throw doubt on Professor Spate's view of the nature of these changes. Following his advice, I read Marx's monograph and discovered there two arguments which are substantially the same as those which Professor Spate propounded in his article: that the British found in India very conservative and isolated village communities; and that a subsequent series of innovations, for which we were largely responsible, resulted in what Professor Spate calls "the break-up of integrated codes of life" in these villages.

The evidence I have drawn from my reading and travels in India has led me to quite different conclusions: that before the days of British rule the various systems of village government in India underwent frequent adjustments to accommodate incoming peoples, inventions and ideas; and that recent alterations in modes of administration, travel and the like have strengthened rather than loosened the ties of loyalty which bind the Indian village communities.

My challenge would, of course, have been made stronger by a review of the Indian evidence. But I considered that my space could be used more constructively by describing, for the sake of comparison, the evolution of the villages of Anatolia, which in their economy and organization are very like those of northern India, and which have been exposed in the last few decades to those same novel influences which, according to Professor Spate, have affected the villages of India.

The University of Manchester

W. C. BRICE

GEOGRAPHICAL FIELD GROUP

Hon. President:

Prof. K. C. EDWARDS, M.A., PH.D., F.R.G.S.

Hon. Vice-Presidents:

Miss A. GARNETT, B.A., PH.D.; A. E. MOODIE, Esq., B.A., PH.D.;

N. V. SCARFE, Esq., M.A.

The Geographical Field Group is a non-profit-making organisation which arranges for parties of geographers to carry out field studies under qualified leaders. In August, 1956, parties will visit Norway and Schleswig: it is hoped to arrange a visit to Portugal at Easter, 1957.

Full particulars of the group and its activities, and copies of recent publications, may be obtained from:—

Miss N. F. LOCKTON, The Hon. Secretary, Geographical Field Group,
THE HOLLIES, NOTTINGHAM ROAD, ASHBY-DE-LA-ZOUCH, LEICS.

Reviews of Books and Atlases

With very rare exceptions, books reviewed in this journal may be borrowed from the Library by full members or student library members of the Association.

The Place-Names of Cumberland, Part iii: (English Place-Name Society, vol. xxii). A. M. Armstrong, A. Mawer, F. M. Stenton and Bruce Dickins. 14 × 22·25 cm. lxxx + 107 pp. Cambridge: Cambridge University Press. 1952. 18s.

The Place-Names of Oxfordshire, Parts i and ii: (English Place-Name Society, vols. xxiii and xxiv). Margaret Gelling, based on material collected by Doris Mary Stenton. 14 × 22·25 cm. liii + 244 pp. and 273 pp. Cambridge: Cambridge University Press. 1953 and 1954. 30s. each.

The county volumes of the English Place-Name Society are now too well known to need any detailed introduction. The three volumes currently under review follow the same basic plan as their predecessors and are of the same high standard.

Volume xxii is the third and concluding part of the place-name survey for the county of Cumberland and, as this reviewer has remarked elsewhere (see *Geography*, vol. xxxvii, 1952, pp. 115–16), it is indispensable to the use of the two first parts (which contain the details of the actual place-names). It starts with a valuable introduction to the Cumberland material as a whole and this is of particular interest because of the way in which the place-names of the county are used to help elucidate its history. There are the usual sections dealing with the bibliography, abbreviations, phonetic symbols, notes and *addenda et corrigenda*. The longest section of the book is devoted to an account of the elements (apart from personal names which are considered separately) found in Cumberland place-names, followed by notes on the distribution of some of them. A short appendix deals with Romano-British names separately.

The place-names of Oxfordshire have been published in two volumes which, taken together, follow a now well-established pattern. The introduction in Part i starts with a short (and very welcome) contribution by Dr. W. J. Arkell on the geological background and on the influence of geology on settlement. Though perhaps inevitable in the circumstances, it is nevertheless a pity that Dr. Arkell felt bound to dispose of "Settlements sited for geographical as opposed to geological reasons" in one comparatively short paragraph. It is not necessary again to enumerate the miscellaneous sections following the introduction because they are the same as those in the Cumberland volume. Following them, however, there are sections dealing with road names, dyke names and river names and with the city of Oxford. The place-names of nine of the Oxfordshire hundreds complete the first part. The second part begins with the names of the remaining five hundreds and then there is a section on the elements found in Oxfordshire place-names. Other aspects dealt with include pre-Celtic or Celtic and French names, the distribution of elements, personal names compounded in Oxfordshire place-names, feudal and manorial names, and saints' names. There is an appendix giving the boundaries of Oxfordshire charters, and this is followed by three indexes—of some words of which the history is illustrated in the volume under review, of place-names in Oxfordshire and of place-names in counties other than Oxfordshire.

Both Cumberland Part iii and Oxfordshire Part ii include a map or maps. The story of the English Place-Name Society's various cartographical experiments, though interesting, cannot be detailed here. The map of Cumberland is good in that it shows heights by means of layer-tints, but the symbols chosen to distinguish the various types of place-names in the county, though clear in themselves, nevertheless fail to emphasize the individual distribution of these types. The method of showing parishes by means of key numbers is not very successful, and the "List of parishes as key to map" given in the volume itself after the index is hardly compre-

hensible in the absence of any explanatory notes. No map should ever bear the statement that "1 inch equals four miles." There are two monochrome maps of Oxfordshire, one showing the main geological formations and the other the hundreds and parishes. Both these maps are clear and useful; and yet, by themselves, they are hardly adequate for a place-name volume. Would it be too much to hope that future county volumes should all include not less than three maps—of geology, of hundreds and parishes and of the distribution of place-name elements? I. S. M.

The Oxford Region: a scientific and historical survey. A. F. Martin and R. W. Steel (eds.). British Association for the Advancement of Science. 19 × 25.5 cm. xii + 202 + v pp. London: Oxford University Press: Geoffrey Cumberlege. 1954. 21s.

The facts that the region here described is an arbitrary section of the English scarplands between Stratford-on-Avon and Reading and that no less than twenty-nine people have contributed to this survey have not prevented the editors and their colleagues from displaying their skill in regional description. A surprising degree of continuity has been achieved by a thoroughly logical order of treatment, roughly equal parts being devoted to the physico-biological background, historical development and contemporary conditions respectively. Individual chapters are self-contained though necessarily brief essays, but collectively they provide an admirable introduction to a varied rural area which had no major urban centre until the advent of motor transport led to the industrialization of Oxford and an extension of the city's influence over the surrounding countryside. Though of special interest to teachers in the area, this survey deserves to be widely read as a study in regional metamorphosis. It maintains the high standard set by other post-war surveys in this series, whose value is further enhanced by each new demonstration of the richness and variety of our country and of the variety of ways in which geographers can contribute to its understanding.

A. J. H.

Devon: a new historical description of country and town. New Survey of England Series. W. G. Hoskins. 15 × 22.5 cm. xx + 600 pp. London. Collins Ltd. 1954. 42s.

Geographers will welcome this important book, the second volume in the *New Survey of England* which, in the words of the general editor, "is designed to provide for each county, within a single volume, a connected account of its history and its present state, together with a brief description of the monuments of the past that it still has to show." Written by an author for whom topography and history are well-nigh inseparable it will become an indispensable book of reference for all who seek information on the cultural landscapes of Devon.

In Part I (c. 300 pages) a General Description which includes consideration of the county's physique and climate in a mere 8 pages is succeeded by two valuable chapters on Prehistoric and Celtic Devon and the English Settlement; then follow a dozen chapters in each of which is treated the history of one major element of Devon life and landscape, e.g., the Land, the Towns, Maritime History. Part II is a useful 200-page gazetteer of Devonshire parishes which could have been improved by the inclusion of a few concise notes on the sites of settlements described; all too frequently reference is made to the parish church and nothing more. A table of population, notes on sources, a bibliography and comprehensive index complete the volume.

The book is well illustrated with 58 plates and 20 maps, including an endpaper "general physical map" and, in a pocket at the end, a reproduction of the quarter-inch Ordnance Survey map of the county, marred by a title and key in script quite out of keeping with the printing on the face of the map and on which the National Grid reference system has been abandoned.

R. S. W.

The New Lands of Elloe. Department of English Local History: Occasional Papers No. 6. H. E. Hallam. 13.5 × 24.5 cm. 42 pp. Leicester: University College of Leicester, 1954. 6s.

This paper has considerable interest to geographers. As its sub-title states, it is primarily a study of early land-reclamation in Lincolnshire but it includes some introductory material on the Anglo-Saxon and Danish settlement of Holland, in the south-eastern part of which lies the Wapentake of Elloe. The paper shows in detail that Elloe was the scene of prosperous farming and land reclamation in medieval times, long before the activities of the seventeenth century drainers. It emphasizes the contrasts between the salt marsh and the fen. The physical geography is treated less successfully than the historical material but in general this paper is thoroughly to be recommended for college and sixth form libraries.

G. J. F.

A Catalogue of Inclosure Maps in the Berkshire Record Office. Edited by P. Walne. 14 × 21.5 cm. 26 pp. Reading: *The Berkshire Archaeological Journal*, vol. liv. 1954-5. 2s. 6d.

This reprint catalogues 150 maps, collected from various sources and accessible in the Berkshire Record Office, which originally accompanied inclosure awards for Berkshire parishes dating from 1778 to 1883. As a guide to source material the list, with its explanatory introduction, will be useful to the student of local historical geography, of land use and of cartography. The catalogue can be obtained from the County Archivist, Shire Hall, Reading.

M. O.

The Drove Roads of Scotland. A. R. B. Haldane. 14.5 × 22.5 cm. xiii + 266 pp. London: T. Nelson and Co. Ltd. 1953. 25s.

Full of interest for the general reader, be he Scots or English, by virtue of its fascinating detail, this scholarly study gives a clear outline of the rise of droving to the cattle markets or "trysts" of Crieff, then Falkirk, through the eighteenth century onward until railways penetrated the Highlands rather less than a hundred years ago. The writer, who has spoken with some of the last Highland drovers—one of them a centenarian in 1948—gives a sound and sympathetic account of the trade, following the drovers from the Outer Isles and Highlands over the hill-passes to the Trysts, then on to the pastures of Yorkshire or the Norfolk Broads. The chapters tell of the early drovers and of cattle thieving; of the life and work of a drover; of the extreme risks faced and the mutual trust which prevailed from the Outer Isles to England when the trade developed; of the drove roads from the Western Isles or through Argyll, the North and North-East; of the Trysts; of conditions north and south of the Border; of the coming of sheep in the nineteenth century; and of decline as the railway replaced the old green roads. The clear end-map was prepared with care and the illustrations are authentic.

A. G.

The British Empire: its Structure and Spirit, 1497-1953. E. A. Walker. 14 × 22 cm. x + 352 pp. London: Bowes and Bowes. 1954. 25s.

Readers of the first edition of Professor Walker's book will need no recommendation from any reviewer. Of the second edition it may be said that it retains the purpose, the spirit and the vigour of the first, but that it has been considerably extended, particularly by its treatment of trends during and since the second world war. The subtitle, "Its Structure and Spirit," gives the keynote: at every stage it is the character of the Empire as Empire that is under examination; and the march of events that contributed to that character and the consequences that flowed from it are brought into high relief. If the author seems to the reviewer to have made a tidier and more polished job of it for the earlier periods, that no doubt arises from the twin circumstances of the simpler organization of those times and the longer

historical view he has been able to take. The treatment of "The First British Empire" and "Law, Order and Security, 1783-1833," brilliant as it is, is in any case only introductory: the bulk of the book is devoted to the period since 1833, almost half of it, indeed, deals with post-1914 conditions, and the last chapter, the longest single chapter there is, covers "The Two Worlds, 1945-53." Professor Walker sees the consolidated Empire of the late nineteenth and early twentieth centuries as the focus of his work. The progress towards its size, shape and character is the theme of the preceding chapters, while the later ones are concerned with the modifications made necessary by the march of events and ideas initiated by the first world war and accentuated by the second. To the telling of the story he brings an incisiveness of mind, a vividness of language and a willingness to make judgments that catch the imagination of the reader, who, even if he feels constrained to differ from the author on some of the more controversial themes of recent years or at any rate to suspend judgment, will find it a fascinating book that is hard to put aside until it is finished.

R. O. B.

The Empire and Commonwealth Year Book 1953-54. Edited by R. S. Russell. 14 × 22 cm. xxviii + 452 pp. London: Empire Economic Union. Newman Neame Ltd. 1954. 45s.

This is the second number of a new venture in year books, designed to fill an obvious gap. With rather more than 400 pages, it remains manageable in size and is convenient to use. This has been achieved by severe economy of words rather than by omission of material, and if the general effect is one of scrappiness it remains true that an immense amount of useful material is deployed on a coherent and uniform plan. Part I is devoted to constitutional and administrative matters, to official and unofficial organizations of Commonwealth and Empire interest, to relevant commercial treaties and so on. Part II deals with the individual countries, arranged alphabetically under the continents concerned, and is essentially statistical, though much other information is given. Here, as elsewhere, the weight is on facts rather than on interpretation, and perhaps that is a strength, not a weakness. Part III brings together information on individual commodities, essentially raw materials and foodstuffs, though a short section is devoted to ship-building. An interesting feature of this section is the net import and export balance for the Commonwealth and Empire as a whole in each of the separate commodities.

Despite the careful comprehensiveness of the work within its chosen range there are one or two surprising omissions. Two instances have been noted: the Colonial Office is listed, but no mention is made of the Commonwealth Relations Office; the Imperial College of Tropical Agriculture is credited with the address of its London office, but there is no hint that it is located in Trinidad, nor is this omission remedied in the treatment of Trinidad in Part II. Such small blemishes will no doubt be removed in future issues. Meantime the Year Book is the handiest available reference work on the Commonwealth and Empire for most of the factual information that teachers and students are likely to want. It deserves to be widely known and used.

R. O. B.

Europe: a regional geography. M. R. Shackleton. 5th edition. 14 × 22 cm. xvi + 525 pp. London: Longmans, Green and Co. Ltd. 1954. 27s. 6d.

Since the last edition reviewed in *Geography*, vol. xxxv, 1950, further revision has been carried out under the capable direction of Professor W. G. East. In particular, statistical tables now refer generally to 1950-1 and new references have been added. It is to be hoped that the European Coal and Steel Community will receive attention in the next revision. A minor point—the (British) Empire still survives on p. 239.

A. J. H.

Jordbrukets Geografi i Norge. A: Tekstbind. A. Sømme. 20 × 27.5 cm. 414 pp. Bergen: J. W. Eides Forlag. 1954. n.p.

Professor Axel Sømme, who is well known to members of the Geographical Association, has added to his *Atlas of Norwegian Agriculture* (Bergen, 1949) a complementary text. The new work is a valuable contribution to the literature of agricultural geography and, thanks to a 35 page English summary and generous English captions, a useful addition to available material on Norway. As the autobiographical preface attests, the book is a product of a life interest in the subject. It reflects intimate acquaintance with the land farmed, a confidence in the writer among the farmers by whom the land is used and his acceptance by the academic agriculturalists who seek to guide Norwegian farm policy.

The Geography of Norwegian Agriculture is packed with information as tightly as the tyre of a Norwegian farm at the onset of winter. Yet it remains remarkably readable. The approach is orthodox, with a broad regional treatment following a clear-cut description of the physical background. To this are added chapters on self-sufficiency in Norwegian food production, the utilization of the fells, the layout of the farmstead, land reclamation and the complementary activities so necessarily undertaken by the Norwegian smallholder. The limitations of large scale cartographic material (understandable when the size of the country is balanced against its national income) dissolve before the contrasting excellence of farm maps accompanying the *Matrikkel* and re-allotment surveys. Professor Sømme emphasizes the rôle of relief. There are maps which show the effect of slope on farm practice, on irrigation and on milk collection; many of the 35 photographs also illustrate this aspect. In general, Professor Sømme eschews the historical background; but explores to the full the statistical material of mid-twentieth century censuses. For the English reader his book will open new windows on a farm scene which is all too commonly represented in geographical texts as little more than a picturesque seter world. W. R. M.

Rome: beyond the Imperial Frontiers. Sir Mortimer Wheeler. 14 × 22 cm. xii + 192 pp. London: G. Bell and Son Ltd. 1954. 25s.

In this work Professor Wheeler directs attention to those wide extra-imperial territories which were clearly in continual relation with, and culturally affected by the Roman Empire. The book is an attempt to summarize and interpret for the interested non-specialist reader the growing volume of detailed archaeological research on regions as separate as southwest Germany, the Sahara and the Indian sub-continent. Professor Wheeler has been at pains to relate this accumulating evidence to what has already been revealed by historians on the basis of the literary documentation. He is often able to show how archaeological evidence complements or confirms historical knowledge, although at times archaeological discoveries stand as the only record of specific past activities and can be only independently interpreted. Incidentally this work underlines the widely held view that history, based solely on literary record, is not enough.

The plan of the work is geographical and thus the more interesting to students of historical geography. The three parts of the book, following a short introduction and followed by a short "Retrospect," examine in turn Roman contacts with Europe, Africa and Asia. Commerce, though supplemented on occasions by military expeditions, appears to have been everywhere the main agency by which Roman civilization made its impact on neighbouring and even distant countries, and finds of Roman coins (so useful for dating relationships) are as remarkably numerous as scattered: they are found in Baltic islands, throughout Central Europe ("Free Germany"), in south India, and even in Indo-China. A wide range of material objects derived from the Empire has also been found on widely separated sites—witness the mausoleum at Germa in the Fezzan oasis.

Many maps, showing trade routes and distributions, together with numerous

excellent plates, contribute to bring vividly to mind the civilized world of antiquity, to which clearly Rome made an enduring contribution. W. G. E.

Czechoslovakia: a geographical and historical study. H. Wanklyn. 14 × 22 cm. xviii + 446 pp. London: George Philip & Son, Ltd. 1954. 30s.

"The framework of Czechoslovakia lends itself to many forms of geographical work" writes Harriet Wanklyn (Mrs. J. A. Steers) in the introduction to her book, and she proceeds to demonstrate her point effectively in the chapters which follow. The regional geography of the country, climate, soils, vegetation, history, farming, industry, trade, communications, population and settlement are treated in turn. There is also a chapter devoted to Sub-Carpathian Russia. On all these aspects of the geography of Czechoslovakia Miss Wanklyn writes with an authority enlivened by a sincere regard for the Czechs and their country. Her style is concise and orderly. The facts are marshalled under a variety of headings and sub-headings which make for easy reference. Bibliographical notes on sources are appended at the end of each chapter and great care has been taken to ensure the correct spelling of place-names. The book is well illustrated but the photographs deserve better reproduction than they have in fact received and some of the maps suffer from over-reduction and from a too liberal use of mechanical stipple.

Miss Wanklyn is concerned throughout to emphasize the physical background of the State as a key to the understanding of its economic and regional geography. In this connection it is pleasing to note that physical geography is not conventionally introduced and then conveniently forgotten. The position of Czechoslovakia in Europe, the interrelationships of its different parts with each other and with other parts of Europe are rather incidental to the main theme. The western part of the State is treated separately from Slovakia throughout and one is left in no doubt that they are distinctive areas, geographically and historically. But apart from a brief account of Czech policy in Slovakia Miss Wanklyn never gets down to considering the implications of the inclusion of two such diverse areas within one state. We are not given anywhere in the book an evaluation of Czechoslovakia as a whole. This oddly shaped state is a wonderful example of the triumph of an abstract idea over the realities of geography. Miss Wanklyn, with her wide background knowledge of central and eastern Europe and with her dual training as an historian and a geographer, is so obviously fitted to develop this theme that it is disappointing to find she has preferred to leave that task to the reader. However, we must respect her resolve not to be moved from the limited objectives she has set herself. She has provided us with an admirable handbook on the intrinsic geographical conditions within Czechoslovakia. Students and teachers alike will be grateful for a scholarly work of reference in the English language on a part of Europe too often neglected in our textbooks. One must admire, too, Miss Wanklyn's tenacity in completing her book in the face of all the difficulties which beset anyone concerned these days with geographical research in central and eastern Europe. H. R. W.

Maps and Politics: a review of the ethnographic cartography of Macedonia. H. R. Wilkinson. 14.25 × 22.25 cm. viii + 254 pp. Liverpool: University of Liverpool Press Ltd. 1951. 30s.

Macedonia is a small corner of Europe and was best known to many people as the home of comitadjis and the like. Mr. Wilkinson shows that this disputed territory can provide the material for an absorbing piece of geographical detection. By diligent research he has discovered over seventy cartographic attempts to display the ethnic distributions of Macedonia. These maps, spread over the period 1730-1946, are by no means entirely of Balkan origin but they all illustrate the well-nigh insuperable difficulties met in attempting to plot ethnic distributions even when

the compiler is free from subjective considerations which, as Mr. Wilkinson points out, is rarely the case.

Maps and Politics is a valuable contribution to the political geographer of the Balkans. Perhaps its greatest value is the warning it gives against the uncritical acceptance of cartographic representation of ethnic conditions. Whatever criterion of ethnic origin may be used—language, religion, nationality, “race,” are almost equally misleading—the fact remains that clear-cut linear boundaries do not exist in regions of “mixed populations.” The present writer knows of no better demonstration of the truth of this statement than the sets of maps contained in Figures 79–87 of this book.

A. E. M.

World without Mercy. The Story of the Sahara. R. Lecler. 14 × 22 cm. 223 pp. London: Werner Laurie Ltd. 1954. 15s.

Tefedest. A Journey to the heart of the Sahara. L. Carl and J. Petit. 14.5 × 22 cm. 250 pp. London: George Allen and Unwin Ltd. 1954. 18s.

The development of regular trans-Saharan road transport services and the fact that tourists are now encouraged to visit even the remote Hoggar mountains might seem to dim the memory of earlier more dangerous days. *World Without Mercy* describes European journeys in the Sahara since the beginning of the nineteenth century and it shows clearly the determination and fortitude of the pioneer travellers and of French soldiers and administrators. But it tells also of the mode of life of some of the Saharan peoples, especially the Tuareg, the “People of the Veil,” who themselves were masters of the Sahara until the French conquest.

A more detailed picture of some aspects of Saharan life is provided by *Tefedest*, which describes a journey made in 1949–50 by four young Frenchmen. Their aim was to discover and record prehistoric rock paintings and engravings in the Tefedest mountains but they also observed the country through which they passed where topography often had “only a very distant relation to what is marked on maps.” Impressions of landscape and people are described in a vivid and entertaining style.

Both books contain some excellent photographs and they form useful additions to the literature of travel.

A. McK. F.

The Prehistory of East Africa. Sonia Cole. 11 × 13 cm. 301 pp. Harmondsworth: Penguin Books, 1954. 2s. 6d.

This is a broad study of early man in East Africa that can be followed and used by an intelligent reader as well as by specialists. In 1871 Darwin thought of Africa as the probable primal home of man and his view has been strengthened, as in most matters he touched, by research in the last generation. Mrs. Cole follows climatic change, change of animal life and of human form and cultural development all in relation to one another. Pluvial maxima in Africa seem to have broadly paralleled Ice-maxima in Europe and some post-glacial wet phases such as the Atlantic period.

There are traces of possible Bushmen in east Africa and several early skulls seem to resemble those of some modern Hamites of North East Africa. The negro type, judging from bony remains, emerged rather late; of course we do not know the skin colour of earlier peoples.

H. J. F.

Agriculture in the Near East. Agriculture in Asia and the Far East: Development and Outlook. Food and Agriculture Organization of the United Nations. 21.25 × 27.75 cm. iv + 78 pp. and 163 pp. Rome: U.N.F.A.O., 1953. 5s. each.

These two reports on current developments and prospects of agriculture in the Middle East and Monsoon Asia respectively provide comprehensive and authoritative data on the technical and economic conditions of agriculture in these areas. The data for Monsoon Asia refer to twelve countries, with China as the outstanding gap.

The reader may find here information on the technical development of agriculture by the extension of agricultural machinery, use of better seed, protection of plants from diseases and pests and improvement of livestock; on the economic side, the investment of foreign and domestic capital, marketing problems and price policies, agricultural credits and co-operatives, rural welfare and the training of advisory staff are dealt with. Not only agriculture but fisheries and forests are discussed. Trends in food consumption and their nutritional implications and the general outlook for production and trade are summarized. In addition to providing a wealth of data from which practical examples of work in progress may be drawn, these publications should give some idea of the vast amount of statistical and other material that has to be collated by international organizations for discussion and eventual framing of suggested policies for the advancement of agriculture. C. J. R.

Methods and Problems of Flood Control in Asia and the Far East.

Flood Control Series No. 2. Bureau of Flood Control of the Economic Commission for Asia and the Far East. 21.25 × 27.75 cm. 45 pp. Bangkok: United Nations Economic Commission for Asia and the Far East. 1951. 8s. 6d.

This short report embodies the second of a series of studies which are being carried out by the Bureau. It begins with a useful introduction which classifies the various methods of flood control in use in the region; relatively simple dykes have been the commonest device, but the multitudinous small tanks of the Indian sub-continent have played their part, albeit unintentionally, and the region is now feeling the force of ideas on multi-purpose river basin development. There follows a review of methods used in each of the countries of the region, which stretches from Pakistan to China and Japan. Finally a number of problems of flood control, especially those connected with dykes, storage, and soil and water conservation, are considered.

There is naturally a great deal of engineering detail in this report, but it is nevertheless valuable to the geographer. It touches on many problems of river behaviour which concern the physiographer (it is amazing to read that the Hwang Ho in flood has a silt content of 50 per cent by weight). The intrinsic interest of its subject and its treatment of that subject alike commend it to the student and teacher of the geography of Asia. It also serves to correct a number of common misapprehensions. It is well produced, apart from a few misprints. B. H. F.

Men Against the Jungle. R. Calder. 14.25 × 22.25 cm. 231 pp. London: Allen and Unwin Ltd. 1954. 15s.

Mr. Calder's inquiry into problems arising through disease, poverty, malnutrition and ignorance led him through seven countries of southern and southeast Asia, ranging from Indonesia to Afghanistan. His book is lively and reliable and will prove of interest, especially to Training College and senior Grammar School students. By vivid description and recorded conversation and with the aid of numerous photographs, the complex problems of the countries visited are well presented. The book gains in reality by showing the impact of the problems on small communities which the author studied at first hand.

Efforts to control yaws, produce higher crop yields, reclaim waste and promote education are seen as joint undertakings of villagers, local officials and specialists. Not least, these local studies emphasize the immensity of the task still to be faced throughout these over-crowded, under-developed lands. W. M. D.

Malaya, Indonesia, Borneo and the Philippines. C. Robequain, trans. E. D. Laborde. 14 × 22.25 cm. xi + 456 pp. London: Longmans Green & Co. 1954. 30s.

This is an excellent translation of a well-known French work. By far the best parts are the general chapters on discovery and partition, the peoples and their

civilization, distribution of population and the peasant and plantation economies. The historical geography is especially well done. The regional geography is covered in seven chapters. These are packed with detail but they are less satisfying than the rest of the book because the maps are not worthy of the text. For example, the account of Singapore contains two useless maps, one (Fig. 14) a mere street plan that does not even cover the whole town, and the other (Fig. 15) a poor effort showing the south of Johore, the neighbouring islands, and an arrow with the words "To Bangkok" by it. Surely a diagram to illustrate the several parts of the city and the land use of the whole island could have been made from the excellent one-inch maps of the Survey of Malaya. The thirty-nine photographs are good.

R. R. R.

Canadian Regions. A Geography of Canada. D. F. Putnam (editor). 17.5 × 24.5 cm. ix + 601 pp. New York: T. Y. Crowell Co. 1954. \$11.00.

This is the most ambitious and authoritative geography of Canada that has yet appeared. The senior authors, Putnam and Brouillette, have spent a lifetime of research on their areas, while Robinson and Kerr are recognized experts on theirs. The book suffers, if anything, from the unequal and different treatment of the regions by the several authors: thus the glaciography of Ontario is more fully represented than that of Quebec or British Columbia; climates are not given similar emphasis. This may result not only from the fact of different authorship, but from the more serious drawback of a lack of a truly regional approach. The book does not deal with either the natural or the human regions of Canada, or with combinations of these, but rather with the Provinces and Territories of Canada and their geographic subdivisions. Thus some of the great unities are lost, as for example the unity of land and life around the St. Lawrence Gulf, or in the Lower Great Lakes—St. Lawrence Lowlands, or on the forested shield from Lake Hamilton to Gt. Slave Lake, or along the W. Cordilleras, from British Columbia to Alaska. In fact, the essential regions of Canada scarcely appear.

The book begins with a most useful survey of the structure and relief, climate, soils, flora and fauna of Canada as a whole, with original contributions on regions of rainfall deficiency and on soil zones. No attempt is made to group these into major natural regions, or to follow them up with major human regions based on ethnic, linguistic, religious and population factors. The bulk of the book is devoted to the physical and economic subdivisions of the Provinces, or of groups of Provinces, and Territories, together with the history of their development and settlement. Here the latest information has been marshalled to present truly vivid and accurate accounts of the natural and cultural landscapes.

J. W. W.

Canada's Tomorrow. G. P. Gilmour (ed.). 15.5 × 23.5 cm. vii + 324 pp. Toronto: MacMillan and Co. Ltd. 1954. 18s.

This book is the outcome of a conference held in Quebec late in 1953, at which Canada's prospects for the next fifty years were forecast and discussed; its chapters, in addition to a general introduction and a very useful, outsider's view from Professor D. W. Brogan, consist of the papers read at the conference by specialists in various fields, and deal with such topics as population trends, natural resources, "cultural evolution," education and the like. Prophecy is highly controversial, and therefore the editor has wisely included a digest of the discussions which followed the various papers; evidently all who attended the conference did not wholly share the views of the principal speakers.

Canada's Tomorrow is not a textbook; while it is full of information, it offers little that is new, except a set of exceedingly interesting assessments of the possible future of a country whose wealth and world influence have increased remarkably in recent decades. Students will profit from reading the sober views of important Canadians on the future of their country.

A. MacP.

The Pacific Northwest. An over-all appreciation. O. W. Freeman and H. H. Martin (eds.). 15 × 23.5 cm. xvi + 540 pp. London: Chapman and Hall Ltd. 1954. 68s.

This book is an up-to-date appraisal of the physical and cultural qualities which give the Pacific Northwest its regional personality. Thirty authors, many of them specialists in their field, have contributed chapters. This gives the book a depth and freshness of outlook which makes it interesting and worthwhile reading. The contributing editors, both experienced teachers, long resident in the Northwest, have arranged the book in five parts: Human Adjustments; Physical Environment; Natural Resources; Agriculture; and Industry, Commerce and Urban Development. Fifty-three maps and twenty-four pages of photographs supplement the text.

It would be rather remarkable if no shortcomings were discovered in a book of this scope. They are, however, few. The omission of the end-of-chapter bibliographies from certain chapters; and a map (Fig. 7) which has its N-S axis running across the page (and no cardinal point!), are examples. On balance the book's merits far outweigh its minor faults.

The book is designed for pre-University and University levels of geography teaching and should find a ready acceptance as a standard textbook in this country.

R. S. M.

The Caribbean: peoples, problems and prospects. A. Curtis Wilgus (ed.). 16 × 24 cm. xviii + 240 pp. Gainesville: University of Florida Press Ltd. 1954. \$4.50.

The papers, from some twenty contributors, which this volume contains were delivered at the Second Annual Conference on the Caribbean held at the University of Florida in 1951. Regional specialists and leaders from business, governmental and educational organizations throughout Middle America have produced a series of brief studies ranging over the fields of health, land, trade, culture and diplomacy. Not all the papers are of equal merit, but most are useful treatments of trends in the Caribbean today, and interpretations of social, economic and political problems and conditions which affect that region.

Rarely is there found within the confines of one book so much up-to-date material dealing with such a variety of topics. These include yellow fever incidence, land use methods, analyses of the region's international trade, the impact of historical developments on trends in literature, a summary of research materials on the area available in U.S.A., and the thorny subject of dictatorship and the foreign policy of the United States in relation to the Caribbean. For the university student and teacher the book is a valuable support to their understanding of Middle America, the emphasis being on the more fully Latin American constituents of the region than on the colonial territories.

G. J. B.

North. The Nature and Drama of the Polar World. K. Rodahl. 13.25 × 20.5 cm. xvi + 224 pp. London: W. Heinemann Ltd. 1954. 15s.

The itinerary which figures so markedly in most polar books is much curtailed in the modern travel book when transport is by air and the journey is soon over. There is plenty of adventure in this volume, but it is condensed and the greater part of the book is devoted to a discussion of polar problems, both physical and biological. The most important perhaps is the discussion on "ice islands," a glacial phenomenon which has recently been recognized. There is a long discussion on Stefansson's contention that "living off the land" is possible. Rodahl does not think this can be done in most parts of the Arctic. A valuable book for any school library.

R. N. R. B.

The White Desert: the official account of the Norwegian-British-Swedish Antarctic Expedition. J. Giaeever. 16.5 × 24 cm. 304 pp. London: Chatto and Windus Ltd. 1954. 25s.

The aims and results of the scientific work of the expedition must be gleaned from this very chronological account written for a wide public; even though appendices by some of the scientists have been added, these would seem to have been severely cut to keep the book to an average length. The descriptions of the ice plateau, ice shelf, sea ice, weather and the history of investigation in this sector of the Antarctic are well drawn and form the part of the book of most value to geographers. H. L.

Geography in the Twentieth Century. 2nd edition. G. Taylor (ed.). 14.25 × 22 cm. xi + 661 pp. London: Methuen and Co. Ltd. 1953. 32s.

It is a tribute to this book that a second edition has been called for within two years of its publication. The first edition was reviewed at length in *Geography* (vol. xxxvi, p. 208) so that a detailed examination of the new edition is unnecessary. Two new and valuable chapters have been added: Mr. W. W. Williams, of Cambridge, writes on cartography and Mr. F. Walker, of Bristol, on "the geographical interpretation of air photography." Thus at least one of the criticisms of the first edition has been met. These two chapters are illustrated by fourteen new plates. For the rest, the earlier edition has been reprinted without change. The editor contributes a preface in which he tries to meet the criticism of the first edition and asserts that some of his early ideas had to wait thirty years before they were accepted. Consequently he does not expect his latest views on determinism and geopotentials to be accepted before 1968 and 1976 respectively. Meanwhile, as was suggested previously, this book could be made a better book without much difficulty: it remains a book which all geographers should read. J. N. L. B.

Splendour of Earth. An Anthology of Travel. M. S. Anderson. 14 × 22 cm. xxvi + 404 pp. London: George Philip and Son, Ltd. 1954. 25s.

Every teacher of geography and every school library should possess a copy of this highly valuable and readable work, which is well produced and very clearly printed. Recognizing that geographers, however learned, are rarely blessed with poetic imagination or with genius in descriptive writing Mrs. Anderson sought out excerpts from gifted authors to illustrate the physical geography, natural landscapes and phenomena of the earth. They are mainly prose passages and the reviewer was entranced especially with those by Philip Guedella, D. H. Lawrence, Hilaire Belloc, Kipling, Conrad and Stevenson. All of the 266 excerpts are not, of course, of equal merit. One senses that in an attempt to make the anthology truly comprehensive Mrs. Anderson was sometimes obliged to lower the standard of selection. Reading this anthology is a richly rewarding experience, albeit humbling, for it reveals with tact and delicacy how much better our geographical work could be if it were written with the brilliance of these excerpts. Maps give the location referred to in every passage and there is a good index and list of sources. A. D.

Principles of Physical Geography. F. J. Monkhouse. 14 × 22 cm. xxii + 453 pp. London: University of London Press. 1954. 30s.

This text is as comprehensive and concise an outline of physical geography as careful selection, compilation, and presentation of material can make it. The book comprises some twenty chapters in which, although (as the author admits in his preface) "the treatment follows the somewhat conventional but logical arrangement of land-forms, oceans, climate, soils and vegetation," a readily assimilable and fairly balanced digest is provided of every aspect of the subject.

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A. AUSTIN MILLER. 8th edition

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METHUEN & CO. LTD., 36 Essex Street, London, W.C.2

Rocks, earth structure and vulcanicity are dealt with in chapters I-III; then follow seven chapters on the processes and products of earth sculpture, two chapters on ocean basins and waters, five on the elements of weather and climate, one on soil and two on vegetation. The treatment of underground water, rivers and river systems, and glaciation is worthy of particular notice, although on p. 125 no specific mention is made of the fact that insequent and subsequent streams grow by headward extension from consequents. The section on weathering is marred by inadequate consideration of the forms resulting from differential weathering and by the omission of any reference to dilatation, now generally acknowledged as a potent weathering process. Pediments are dismissed in 11 lines of text while wind abrasion gets 51 lines and a diagram; in fact, the action of water in desert and semi-desert areas receives wholly insufficient attention. A valuable feature of the section on climate is a fairly detailed consideration of Professor Austin Miller's classification; this is followed by admirable chapters on soils and vegetation, a conclusion in which field work and map interpretation are mentioned, and an appendix of suggestions for further reading.

Illustrations form an integral part of the book and almost all of the 260 maps, diagrams and photographs are clear and unambiguous. But fig. 12, p. 33, does not "show *how* the development of a river system . . . can produce synclinal mountains," the structure illustrated on plate 10 is far from self-explanatory and the explanation of plate 59 is grossly misleading.

These minor blemishes do not greatly detract from the utility and value of this book as a school text which is probably the most comprehensive of its kind to appear for many years. But therein lies its greatest weakness. Its author's treatment of nothing less than the whole content of physical geography is perforce unsatisfying and superficial in part: yet the book is recommended to university students. Surely even if it is still unfortunately necessary to provide such concentrated, pre-digested and mentally unappetizing fare at school undergraduates should be spared further helpings and permitted a little indigestion.

R. S. W.

General Principles of Geology. J. F. Kirkaldy. 15.5 × 23.5 cm. 327 pp. London: Hutchinson's Scientific and Technical Publications. 1954. 25s.

Textbooks of geology, as of other disciplines, may legitimately show wide variations in scope and intention. A few, like Geikie's classic, are veritable storehouses of fact, comprehensively treating the whole science and representing virtually the sum of the agreed geological knowledge of their time. As that sum has increased more recent works of comparable authority deal only with one or other of the major subdivisions of the subject. On the other hand, as every teacher knows, there are many texts whose function is rightly described by their titles as "introductions" to their subjects, while yet others, ranging somewhat more widely, deal with the "elements" or provide an "outline." Most ambitious perhaps are those which attempt to distil from a subject its "principles."

Dr. Kirkaldy's book is not one of these; it would be better described as providing the elements or an outline of geology. It ranges over the whole field of the subject after the manner of an introductory course of lectures—indeed it might be a well-illustrated set of lecture notes. Respect for principle is shown chiefly in the desire to lead into a topic by consideration of some relevant facts which the student may see for himself in the field. But few principles actually emerge and the chapter entitled *Basic Principles* deals mostly with basic facts. The treatment is commendably brief and light though it lacks insight and accuracy. Some errors are simple mistakes like the use of "terminal curvature" for "outcrop curvature" on page 45; others are plausible-sounding untruths like the statement on page 44 that "gravity is one of the most effective agents of transportation." The most horrifying error of

all meets the reader in the opening paragraph of the preface where the author confuses induction and deduction; the pleasantest is due to the type-setter who has seen fit to open Section B with a flourish of Baskerville italic capitals.

D. L. L.

Climatic Change. H. Shapley (ed.). 16 × 24 cm. xii + 318 pp. London: Oxford University Press: Geoffrey Cumberlege. 1954. 48s.

This book is the outcome of a two-day conference at the American Academy of Arts and Science, at which various specialists debated the evidence for and the causes of climatic change. There are twenty-two articles varying in length of print and breadth of view, but few contributors have enough space to add anything new; the longest (Palaeoclimatology and Climate) is also the narrowest and therefore the deepest and most worthwhile.

Since the list of contributors is made up of six astronomers, three geologists, four meteorologists, four palaeontologists, two anthropologists, a geophysicist and a geochemist, "the discussion ranged from the presumed giant planet of the star 61 Cygni to the Oparin soup at the bottom of the primitive oceans," and it is not to be expected that they ever met on common ground, or that they weighed and compared the evidence for rival theories. Many of the individual articles are stimulating and the periphery of the problem is illuminated from many interesting angles, but the centre remains as dark as before.

A. A. M.

Physical Meteorology. J. C. Johnson. 15.25 × 23.5 cm. xii + 393 pp. London: Chapman and Hall Ltd. 1954. 60s.

This book derives from the author's lecturing experience at the Massachusetts Institute of Technology; it deals with those aspects of atmospheric physics not directly concerned with the circulation or with synoptics; and the author justifiably indicates that it is meant for readers possessing a thorough grounding in general physics. It is well supplied with references to current work and includes a number of exercises for the student. The arrangement is uneven and the writing is not easy to follow (e.g., pp. 29, 206, 260, 261); the elementary and advanced are at times disconcertingly mixed, e.g. on p. 204 it is odd to find a footnote defining an adiabatic process in a book assuming familiarity with basic thermodynamics and capacity to cope with the mathematics of atmospheric scattering of radiation. With the long chapter on atmospheric electricity, the discussion of radar meteorology and of methods of measuring the height of the ionosphere, it is evident that this book is not intended for, neither is it likely to attract, teachers or students of geography at any level, with the exception of the occasional reader with enough keenness to maintain some atmospheric physics as a hobby.

G. M.

The Story of the Oceans. J. Scott Douglas. 13 × 20 cm. 272 pp.
The Margins of the Seas. M. Burton. 13 × 20 cm. 210 pp. London: Frederick Muller. 1953 and 1954. 15s. each.

These two books are mainly concerned with marine fauna. In approach and presentation they differ very markedly, but they are to some degree complementary, the one dealing with animal life between tide-marks, the other ranging far and wide over the oceans.

The Story of the Oceans is written in a breezy style that is entertaining at first, but which some may find tiring after a while. The first half, with chapters on the early hydrographers, the ocean floor, tides and currents, is of greatest geographical interest. Probably the best section is on the idiosyncracies of island life, and islands as "laboratories of evolution." In the remaining 150 pages the habits of all manner

of creatures from protozoa to whales are described. The treatment is necessarily superficial but may well encourage the reader to dive deeper.

Dr. Burton is a distinguished marine zoologist and *The Margins of the Seas*, though written for the non-specialist, is a much more serious and important book than its fellow. The behaviour of the sponge, jellyfish, sea-anemone, lugworm and barnacle, amongst other shore animals, is described in some detail and their methods of growth, reproduction and adjustment to habitat are outlined. The main theme running through the book is that the inter-tidal zone is the testing-ground for life emerging from the sea to take up a terrestrial existence. Numerous allied controversial questions are introduced and we are led to consider the significance of the psychological factor in natural selection, the extent of evolution in pre-Cambrian times, and whether change of habit precedes change of form in evolution, or vice-versa. Set in this context the lowly creatures of the sea-shore acquire a new interest in the eyes of the non-zoologist.

These are books more suited to the biological than the geographical sections of school libraries. *The Margins of the Seas* might well be recommended for reading in bio-geography to first-year University geographers.

A. T. G.

Map and Landscape. D. Sylvester. 14 × 23 cm. xvi + 287 pp. + 8 pp. plates. London: G. Philip and Son Ltd. 1952. 25s.

This book contains three sections—the first two parts follow fairly closely the standard treatment of map reading and field study and contain (as would be expected from the author) a most admirable study of settlements. The third section is less common and the preface claims its originality—it includes material on horizons, fields of vision, perspective, field sketching, block diagrams and panorama drawing from maps. Fifteen coloured plates of various European maps and two appendices on the preparation for field excursions complete the book. Whilst much of the text is most thorough the author seems over-anxious to make sure that nothing is overlooked. Greater selection in the earlier parts of the book would have allowed for more detailed treatment in Part III, in which some topics savour of academic exercises. It is a pity that the author does not make more use of the supplement of coloured maps. Nevertheless the book reflects the enthusiasm of the author for field work and throughout the text one senses an inquiring mind at work. Whilst the book is designed for advanced students it has its place on the shelves of the sixth-form geography library in grammar schools.

N. K. H.

Man, Time and Fossils. Ruth Moore. 22 × 14 cm. 382 pp. London: Cape, 1954. 21s.

Ruth Moore here acts as a non-specialist reporter on the progress of evolutionary theory and its application to the special question of the evolution of man's anatomy. She has achieved a great success in exposition, obviously with help from researchers who probably could not put the case to the general public themselves. The authoress is American and has been in especially close touch with Professor Washburn of Chicago who has contributed so much to human biology.

There are chapters on the greater thinkers, three on Charles Darwin and one each on Lamarck, Giard, Cope, de Vries, Mendel, J. B. S. Haldane, Sir R. A. Fisher, and Sewall Wright. The two notable omissions are T. H. Huxley and Dobzhansky, but they are mentioned. The tribute to Lamarck is appropriately generous while decisively rejecting the theory of the inheritance of acquired characters. The strengthening of the theory of natural selection in recent years is well brought out. The romance of the finding of ancient man and ape men in Java, North China and Africa is interestingly reported, as are the new methods of dating by measuring fluorine absorption in bone and by disintegration of radio-active carbon (atomic

weight 14) from organic remains. The latter method has restored the lower dates for early man current 30 years ago as against the higher dates worked out by astronomers and accepted by some general writers. H. J. F.

Archaeology from the Earth. Mortimer Wheeler. 14 × 22.5 cm. xi + 221 pp. Oxford: Clarendon Press. 1954. 25s.

The author, and his late wife Tessa Verney Wheeler, developed the process of scientific excavation on a scale and with a minuteness of control and oversight previously almost undreamt of. These methods were notably used in pre-war days at *Verulamium* and at Maiden Castle, near Dorchester, where many younger workers were initiated into the full rigours of the game. Wheeler has since worked at Harappa and Mohenjo Daro in Pakistan and in this book he sums up his experience and gives counsel to those who will come hereafter, one hopes with further improvements. One thinks of the measuring of time by accumulation of fluorine in buried skulls and how this has solved the Piltdown puzzle and dated the Swanscombe skull, as well as of the gradual loss of radio-active carbon proceeding over thousands of years and allowing a little closer dating of objects than had hitherto been feasible in many cases. Dating is, for Wheeler, a very important matter and he scorns the subterfuges of using vague periods to hide ignorance. Three-dimensional placing and recording of observations and finds has been developed by Wheeler to a fine art but he tells us, and we are not surprised to hear, that the many-sided genius of the great Thomas Jefferson applied soil stratigraphy to archaeological interpretation in Virginia in 1784.

Wheeler has been a notable contributor to the reconstruction of history and prehistory on the basis of excavation, but these matters are hardly touched upon here; this is a guide to the responsible work of excavation. Sometimes perhaps it is well to leave untouched parts of a site or a monument for future workers with new processes, but this must be a risky decision to take. H. J. F.

Archaeology. S. G. Brade-Birks. 220 pp. **Anthropology.** J. E. Manchip White. 191 pp. (Teach Yourself Series.) 11.25 × 18 cm. London: English Universities Press Ltd. 1954. 6s. each.

These little books are lively and thoughtful, the archaeological one the more original and stimulating of the two. The anthropological one follows conventional lines in its physical portion and was written before the Piltdown case became so notorious. The author wisely treated the Neanderthal group as a side-branch rather than an ancestral stem. The cultural section discusses cultural exchanges and diffusion and has useful notes on social grades and genealogies and on many other matters.

The archaeological book treats of soils and evidence from carried pollen grains, and discusses techniques of stone working and of metallurgical processes. As it is published in Britain for British readers it naturally emphasises local evidence, but it seems free from abstract classifications and should be a helpful guide to larger works. Of course in both books the illustrations have to be very small. H. J. F.

An Introduction to Anthropology. R. L. Beals and H. Hoijer. 15 × 23.5 cm. xxi + 658 pp. New York: The Macmillan Co. 1954. 42s.

A useful college text book with guidance for further reading, it covers the anatomical evolution of man and his regional diversities, material equipment, social organization and institutions, religion, the arts, language and education. Fellow workers know how difficult it is to keep up to date and one may suggest a few points needing revision. *Homo sapiens* is now thought to be older than the specialized

Neanderthal type and the idea of crosses between the two seems overworked here. The Rhodesian skull (Broken Hill) is almost certainly late Pleistocene and the Galley Hill skull probably even later. Piltdown Man should disappear from scientific discussion, Boas's ideas on the changes in head form supposed to occur among descendants of certain Europeans in U.S.A. are very doubtful.

The discussions of the negro in U.S.A. and of anti-Semitic prejudice are notably liberal and reasonable. The studies of society are mostly taken from among non-literate peoples. The discussion of religion cautiously avoids opportunities for barren controversy. The study of marriage seems a very fair introduction to the lines of thought of several schools of anthropological research. H. J. F.

Chisholm's Handbook of Commercial Geography. L. D. Stamp and S. C. Gilmour. 14 × 22.5 cm. xiii + 915 pp. London: Longmans Green and Co. Ltd. 1954. 60s.

Chisholm's *Handbook* was first published in 1889 at a time when the University study of geography was virtually unknown in Great Britain. The author originally intended the book for "teachers who may wish to impart additional zest to their lessons in geography from the point of view of commerce, pupils in the higher schools and colleges . . . and those entering a commercial life, who take a sufficiently intelligent interest in their business to make their private studies bear on their daily pursuits." For each of these three groups the *Handbook* has been a standard reference work. In the course of its fourteen editions the contents have undergone a process of growth and evolution. This latest edition replaces the 1937 edition, which was itself an almost complete rewriting by Professor Stamp, and incorporates the result of very considerable revision and rewriting by Professor Stamp and Mr. S. C. Gilmour. The general framework of the book remains almost unchanged. A consideration of the main factors influencing the production and distribution of the products entering into international trade is followed by an outline of the areas and conditions of production of the principal commodities, while about two-thirds of the book is concerned with a country-by-country treatment in which emphasis is given to the changing role of each country in the world economy.

The warm welcome which will be given to the reappearance of Chisholm's *Handbook* may be tempered only by disappointment at the existence of a number of mistakes and inaccuracies, ranging from careless slips in proof reading to occasional and more serious mis-statements of fact as, for example, in the discussion on Birmingham on pp. 346-7.

The successive editions of Chisholm afford rich material for tracing the dramatic changes of the last sixty-five years in world production and trade. In assembling and summarizing a prodigious quantity of material concerned with changes in the world economy during and since the Second World War the authors of the new edition have performed a very useful service. M. J. W.

Economic Geography. (Revised Edition.) C. F. Jones and G. G. Darkenwald. 18 × 24.75 cm. xxv + 612 pp. New York: The MacMillan Co. 1954. \$6.75.

Even allowing for the obvious difficulties in chasing the rapid post-war changes, only moderate success has been achieved in the first revision of this well-known "occupational" approach to economic geography. The statistical revision rarely includes figures later than 1950, whilst many of the diagrams, as in the earlier edition, give no indication of the date to which they refer. The sections on subsistence economies stand almost entirely in their original form, ignoring the influences of the various U.N. agencies, the Colombo Plan, etc. The major addition is a chapter on the Chemical Industry by Professor Petterson. This is a useful summary of the

industry in the U.S. if not for the rest of the world. Elsewhere the revisions are mainly brief in the extreme; e.g., the only addition to the section on coal-mining in the U.K. is "The British coal industry was nationalized in 1946." Perhaps the authors regard this as adequate explanation. On the credit side, many of the photographs are new and of better reproduction than in the first edition, and the revised bibliography is a good guide to more specialized reading. For the school teacher not already familiar with this work, it has some useful material for "sample studies" of farm types.

A. C. W.

World Population and World Food Supplies. E. J. Russell. 16 × 24 cm. 513 pp. London: George Allen and Unwin Ltd. 1954. 50s.

This is an encyclopaedic survey of agricultural production in all the major countries of the world by a recognized authority on farming techniques. Dispensing alike with the pugnacious assertiveness of Vogt and the ebullient and wrong-headed optimism of de Castro, Sir John Russell faces the problem of a possible world food shortage with the practical question—what can the world's farmers do about it?

He finds that the answer is just as complex as the problem itself. There is no general panacea—yields may be increased in one area; new crops introduced into another; burdens may be lightened, shifted or shared. The farming front has innumerable facets and small gains on a number of these may well tip the balance between famine and plenty. Hence his attitude of "tempered optimism." The problem is not entirely new and science has potent weapons in its armoury.

The book is not easy reading—it keeps too closely to the facts and they come in dozens to the page. The geographer will find it an invaluable work of reference and a convenient guide to a great mass of statistical material. Yet it is much more than that! Scattered through the text are innumerable glimpses of the practical difficulties facing the man in the field and of the tantalizing possibilities challenging research in the laboratory. It is thus an authoritative survey of the whole range of farm activity.

The basic approach is regional—Europe, Africa, Asia, the "food exporters" (U.S.A., Canada, Australia and New Zealand) and the "potential suppliers" (the South American countries) each being allotted separate sections. As a result the over-all view tends to be lost in the mass of detail. Thus Sir John does not strongly justify his implication that South America is the hope of the world nor does he directly question Stamp's concept of the "underdeveloped lands." Nevertheless the facts are here: the reader may judge for himself.

P. R. C.

The consolidation of fragmented agricultural holdings. FAO Agricultural Studies No. 11: Sir Bernard O. Binns. 23 × 15.5 cm. iii + 99 pp. Washington: Food and Agriculture Organization of the United Nations. 1953. 5s.

Much valuable material for geographical research is to be found in the many publications of UNFAO but few are likely to be of greater interest to "human" geographers than this concise report. Part I outlines briefly the meaning, causes and effects of fragmentation, and considers the problems relating to consolidation. In Part II the problem is illustrated by reference to selected countries: Denmark, France, Ireland and Switzerland. Much useful information is given in both parts and though the report is best used in conjunction with large-scale maps, sufficient examples are included by way of illustration to make the text intelligible to readers who have no convenient means of access to foreign maps.

Among other FAO reports received by the Association may be noted *Soil Surveys for Land Development*, FAO Agricultural Studies No. 20, 1953; and *Cadastral Surveys and Records of Rights of Land*, FAO Agricultural Studies No. 18, 1953.

A. J. H.

The State of Food and Agriculture 1953, Part II, Longer Term Prospects (January 1954); The State of Food and Agriculture 1954 (August 1954). Food and Agriculture Organization of the United Nations. 21.25 × 27.75 cm. iv + 83 pp. and vi + 157 pp. Rome: U.N.F.A.O. 5s. and 7s. 6d. respectively.

In these publications the FAO provides an annual review of economic development in agriculture, fisheries and forestry that is a necessary companion for every geographer concerned with these matters. The review for 1953 was in two parts, of which the second, on longer-term trends, aimed at providing "an overall picture of how the food and agricultural situation may develop in the next few years if governments' present objectives and estimates are realized." Trends by major commodities are summarized. Very broad regional estimates are given, while technical factors affecting achievement of production objectives are discussed. For 1954 the report is in one volume and follows the more usual lines, reviewing the year's developments and the immediate outlook, both by commodity and by the same broad regions.

C. J. R.

Harrap's 3-D Junior Atlas. F. Debenham (ed.). 20.5 × 28.5 cm. 32 pp. London: G. G. Harrap. 1955. 7s. 6d.

Oxford School Atlas. Prepared by the Cartographic Department of the Clarendon Press. 19.5 × 26 cm. viii + 104 pp. + xxxi pp. gazetteer. London: Oxford University Press. 1955. 10s. 6d. (boards), 9s. 6d. (limp).

Harrap's Junior Atlas, consisting almost entirely of physical maps, gives prominence to the representation of relief by means of conventional greens and browns assisted by hill shading with oblique lighting of photographed relief models. The effect is pleasing to the eye although lacking in precision, as contours are absent and spot-heights few. The printing is generally clear, but on some maps, e.g. New Zealand, the heavy shading tends to obscure the names of several physical features. Railways are marked only on a world map occupying a half-page, insets are reserved for political or, in the case of Britain, administrative maps, and other information concerning social and economic geography is crammed into half a dozen world maps on the last two pages. The gazetteer locates places by means of page and grid references, not by latitude and longitude. This atlas is suitable for introductory work with young children but in view of its elementary nature the price is rather high.

For another two shillings the Oxford School Atlas offers three times as many maps and obviously caters for more advanced students. Relief is shown by layer-colouring; smaller scale maps are photographed relief models, overprinted with layer-colouring and other symbols. The printing is clear, the symbols are consistent, and cross-references are subtly encouraged. Many commendable devices enhance its value as a basis for sound geographical study in school—for example the positioning of maps of Japan and New Zealand, drawn to the same scale, on adjacent pages, and the clear but unobtrusive insertion of historic voyages and journeys of discovery on the physical map of each continent. Although in general the insets contain much valuable information, those labelled respectively "Annual Rainfall" and "Structure" in the corners of each continental map could be omitted, since the world maps of these phenomena on pages 95 and 97 give more information with greater clarity. All the regional maps extend without borders to the edges of the page, which may sometimes result in loss of marginal detail due to inaccurate register of printing plates or page trimming, and later to careless handling. It is gratifying to observe that this handsome production incorporates many of the features advocated by a Committee of the Geographical Association in its Memorandum on atlas content (*Geography*, vol. xxxviii, 1953, pp. 33–5) and it can be strongly recommended to secondary school pupils (and their parents!) for work up to and including G.C.E. levels.

L. J. J.

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